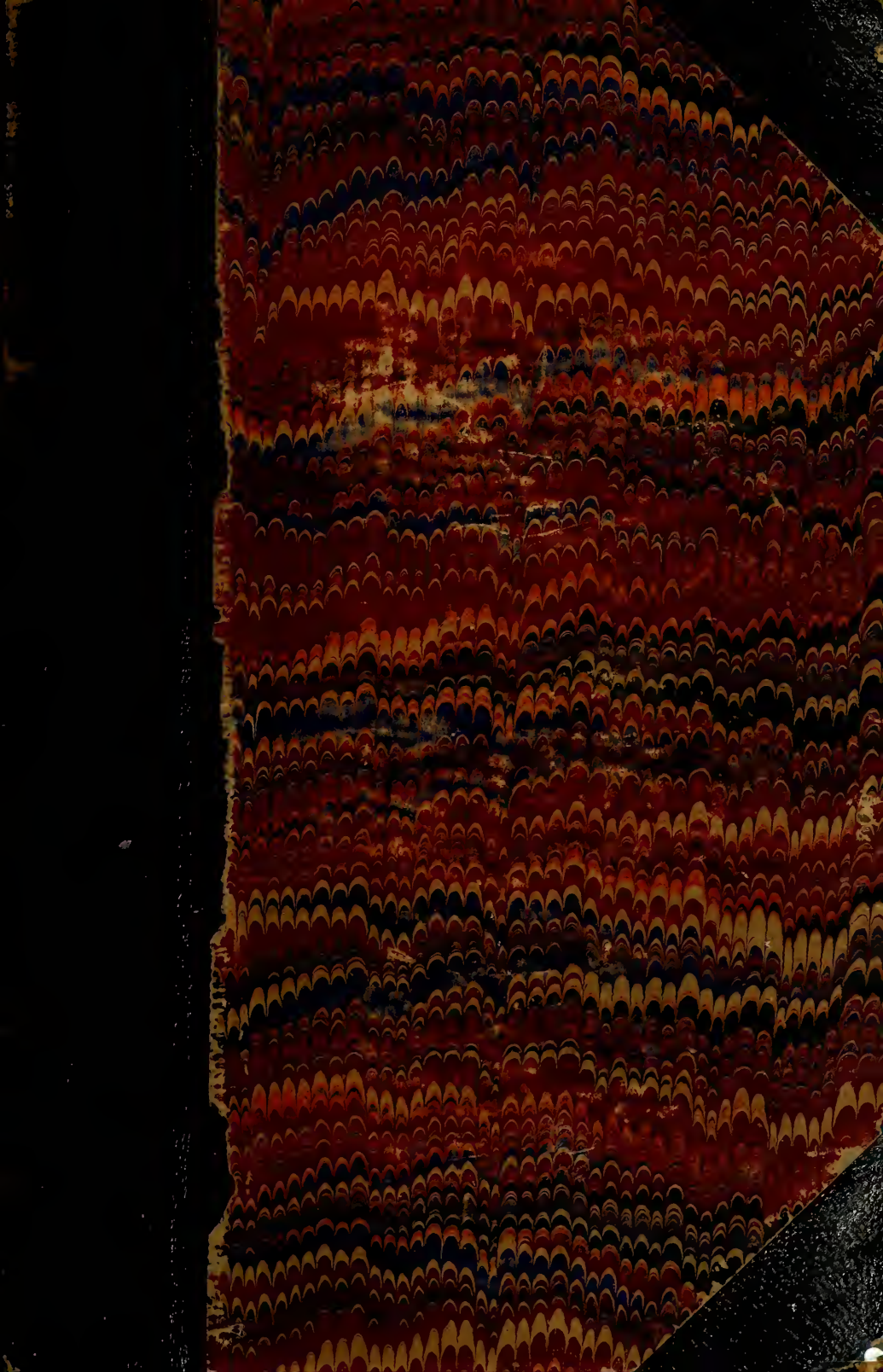

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REPORT

OF THE

CHIEF ENGINEER

UPON THE

PRELIMINARY SURVEY, REVENUE,

AND

COST OF CONSTRUCTION,

OF THE

SAN FRANCISCO AND SACRAMENTO RAIL ROAD.

SAN FRANCISCO:
PRINTED BY WHITTON, TOWNE & CO., EXCELSIOR JOB OFFICE,
151 CLAY STREET, NEAR MONTGOMERY.
1856.

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JEROME C. DAVIS, YOLO COUNTY.

REPORT.

San Francisco, February, 1856.

To the President and Directors of the
San Francisco and Sacramento Rail Road:

Gentlemen:—The route for your Rail Road from Benicia to the City of Sacramento has been examined, and a preliminary survey made, establishing not only its entire practicability, but developing many new features to be regarded as highly favorable in the construction of your Road.

A few remarks upon the geographical position and general character of the country, the peculiar features and characteristics of the line, are considered necessary to a full understanding of the subject.

The State of California has a geographical formation peculiar to itself. Its western shores are washed by the waters of the Pacific Ocean, presenting, with few exceptions, an inhospitable, rugged and rock-bound coast, destitute of harbors, bays or safe anchorage ground.

Two ranges of mountains traverse the State in a northerly and in a southerly direction. The eastern range is the Sierra Nevada, forming the natural eastern boundary of the State. Upon this range and its western slope is found the principal mining territory of California, and exists a majority of the mining population of the State.

The western range is called the Coast range, forming the natural western boundary, and a barrier to the Pacific Ocean.

These ranges merge together in the northern part of the State, or rather, are connected by the Pitt River mountains, which with their slopes form a northern barrier to the great internal basin.

Between these ranges lies a great basin, extending from the 35th to the 41st parallels of latitude, the width of which varies from 30 to 100 miles.

The Sacramento river flows southwardly and the San Joaquin northwardly through this basin, uniting their waters at the head of Suisun Bay. This basin or plain carries an ascending grade of about one foot per mile, from Suisun Bay to Marysville, and about four and a half feet per mile from the City of Marysville to the entrance of the canon leading from the Plains to the town of Shasta, attaining an elevation of about seventy feet at Marysville, and about six hundred feet at Shasta, above tide level.

Into this part of the Sacramento Valley flow numerous streams, having their sources in the Sierra Nevada mountains, and it is upon these streams and the ravines leading into them that the most important portion of the mining operations is carried on. A large portion of the land adjoining these rivers is subject to overflow. A species of swamp grass growing upon the overflowed land gives it the name of tule, or tule land.

The main ridge of the Coast Range crosses at or near Benicia, where it is separated by the Straits of Carquinez, continuing southerly upon the eastern side of San Francisco Bay, under the name of Contra Costa or Monte Diabolo Range.

Another spur or range keeps more westwardly, close to the ocean, enclosing the waters of the Bay of San Francisco, and joining the Contra Costa Range again near San José. This range is pierced by the far-famed Golden Gate, which forms the avenue of entrance to the City and Bay of San Francisco, dividing the range into two peninsulas. Upon the extreme northern part of the southern peninsula is situated the City of San Francisco, accessible only by land from the south side. The northern peninsula is rugged and mountainous, its shore line so sinuous and abrupt in its windings, and the foot hills so bold and rugged, that an approach to San Francisco by a Rail Road line from this quarter is impracticable, beyond all question.

The Bay of San Francisco is about ten miles wide, extending southwardly about forty-five miles. Northwardly, it extends about ten miles, when spurs of the mountains encroach upon its limits, narrowing it up at Pt. San Pablo to about two and a half miles. It immediately expands again into a spacious bay, about twelve miles in diameter, which, although properly a part of the Bay of San Francisco, yet from its locality is called San Pablo Bay.

Turning to the east the Bay again becomes contracted in width, and the Straits of Carquinez, about eight miles in length, dividing the mountains, connect San Pablo Bay with the waters of Suisun Bay. Here we strike the great internal basin, which is called upon the north the Sacramento Valley.

The City of Benicia lies upon the north side of Carquinez Straits, where they enter Suisun Bay.

Suisun Bay is the last of the chain of salt water bays, and runs in a

north-easterly direction, about fifteen miles, being five to ten miles in width. This bay is generally shallow, and filled with low, marshy islands. The San Joaquin from the south, and the Sacramento River from the north, unite their waters at the head of this bay.

It will be observed by a consideration of the above, that the topographical features of the country are peculiar.

San Francisco, the great commercial emporium of the Pacific, is in a measure isolated—cut off from the northern and eastern portion of the State. Four-fifths of all the population, wealth and mining interest of the State lie north and east of San Francisco. There is but one *great* thoroughfare from San Francisco, and that is by way of the San Pablo Bay, Carquinez Straits and Suisun Bay to the northern and eastern mines. Five-sixths of all the goods sent to San Francisco go over this thoroughfare to the interior. The trade of San Joaquin, Tuolumne, Mariposa and a portion of Calaveras counties passes over a portion of this route, and down the San Joaquin Valley, by way of Stockton.

The counties of Marin, Contra Costa, Alameda and Santa Clara are supplied by small craft, direct from San Francisco.

The counties of Solano, Napa, and the southern portion of Sonoma are supplied *via* San Pablo Bay and Suisun Bay, over a portion of this route.

The counties which are wholly supplied by means of the great northern and eastern thoroughfares, *via* Bays of San Francisco, San Pablo, Suisun Bay and the Sacramento River, are enumerated as follows, viz: one-half of Calaveras, Sacramento, Yolo, Eldorado, Placer, Nevada, Yuba, Sutter, Sierra, Butte, Colusi, Shasta, Siskiyou, one-half of Trinity, and one-half of Klamath.

It will be seen that nearly three-fourths of the whole population of California, and nearly all the principal mining counties of the State, are supplied *via* Benicia and Sacramento over this great thoroughfare. The line of the direction of business is north-east and south-west, and it is upon this line or direction, and to do this business, that it is proposed to build your Road.

It has been found in the United States, as in other countries, that the *paying roads* are those which are built in the natural direction of business, while the non-paying ones are those which strive to divert or turn the natural direction of business by running athwart or at right angles to it.

Your Road will be in the *natural line of the great interior business*, and must be the key to all travel to and from San Francisco. All roads leading into the City of Sacramento and into the Sacramento Valley Rail Road must help yours; it, in fact, commands the whole northern and eastern country.

The City of Sacramento is situated upon the Sacramento River, ninety miles from Benicia and one hundred and twenty from San Francisco.

An air line from San Francisco to Sacramento passes through Martinez, or about one mile south of Benicia. From San Francisco to Benicia is twenty-eight miles; from Benicia to Sacramento, *via* your Rail Road line is fifty-eight miles; *via* the river and present line of travel it is ninety, or thirty-two miles longer. This is occasioned by the windings of the Sacramento river. The time consumed by the first class steamers in making the trip from San Francisco to Sacramento is usually, when no interruption occurs, eight and a half hours; returning, about seven and a half hours. Your Rail Road can be run in one and a half hours; allow two more to San Francisco, and the time is reduced to three and a half hours.

The City of Sacramento is the principal point of debarkation for the north-eastern mines, and is the head of navigation for first class steamers. So important is the business here, that a Rail Road has been built to do the business now transported by wheeled vehicles into the mines.

The width of the Valley at this point is about forty-five miles. The Sacramento river is about equi-distant from the foot hills. A broad belt of low land lies on either side of the Sacramento River, which is overflowed in high water. From the great extent of country overflowed, it has been thought that a Rail Road route could not be had across the tule, but recent surveys prove to the contrary. A lake called Tule Lake, lying about one and a half miles west, and parallel with the Sacramento River, extends up about opposite the City of Sacramento. Your line runs around the head of this lake, and crosses the low land in a very favorable place. There will be about five miles of tule land to cross, the greatest height being about sixteen feet; eight miles out strikes ground above the reach of the highest water.

The only works upon your Road of importance, are the crossing of the tule lands and some tolerably heavy cutting in rounding the point into Benicia.

DESCRIPTION OF LINE.

FIRST DIVISION.

The line commences in the village of Washington, opposite the City of Sacramento, at the intersection of —— street and the river, and following the line of —— street about 3,000 feet; thence curving southerly, with a radius of 11·460 feet for 2,500 feet, the line enters the low or tule lands; continuing thence straight for 28,750 feet, or about five miles, it crosses the main tule, crossing the traveled road at the western edge of the tule, being about midway between Gale's Shanty and the Tule Houses; curving then gently to the south, with a radius of 11·460 feet for 2,000 feet in length, its runs straight to the Puta Creek at Davis', crossing the traveled

road about one-half mile west of Rigg's House, passing about three-fourths of a mile south of G. F. Brown's house.

This Division extends from Sacramento River to the Puta Creek, is thirteen miles in length and embraces the heaviest portion of the graduation and piling on the Road. The top of the river bank at Washington is assumed as high water mark. The grade is laid two feet above it, and carried out level across the tule, until it strikes the high ground ten miles from Washington. The greatest depth of filling is sixteen feet, for three and a half miles, when it gradually lessens to the grade line at either end. It was first proposed to cross this low ground with a continuous piled bridge, five miles in length, as the soil was supposed to be loose and marshy, affording a precarious support for a heavy embankment, but subsequent examinations show the soil to be a tough, hard blue clay, intermixed with occasional layers of gravel, affording a compact, solid material for embankment. It is proposed to build one and a half miles of *piled bridging*, and fill the rest with solid embankment, which costs no more than piling. The *piled road* will be formed by driving a row of four piles transversely, five feet apart, each ten feet. Capping these with 10x12 timbers, and laying stringers longitudinally over the two center piles, the stringers being made each of two sticks 7x16, bolted together with bearing blocks, so as to leave an inch space between them. Two 4x12 braces extend diagonally from top to bottom of outside piles, to which they are bolted with three-fourths inch iron; braces (eight inches square) extend from centre piles longitudinally to the stringers on either side. Stringers are boxed down an inch on to caps, and the caps boxed an inch to prevent the stringers from spreading laterally. Cross-ties eight feet long, 3x8, are spiked across, on top of stringers, and for this purpose the rail spikes should be made eight inches long, so as to fasten both rail and tie to the stringer.

It is recommended to procure two miles of continuous rail for the piling and bridges on your Road, the extra cost of which, at seventy-five pounds per yard, will not exceed $4,500. There will be about 4,300 piles, averaging thirty feet in length, and about 700,000 cubic yards of embankment on this Division.

SECOND DIVISION.

Curving to the south with a radius of 11·460 feet for a distance of 5,650 feet, the line crosses Puta Creek with a *truss bridge* of 300 feet in length, and continues straight to the *Montezuma Hills*, or end of the second division, a distance of twenty miles, or thirty-three from the Sacramento River.

The *line* on this division passes over almost an unbroken plain, the line being uniformly straight, with grades of five and ten feet per mile. There

is no *cutting*, the grade being so adapted to the surface as to give a general height of embankment of three to four feet. The only *structures* of any importance are two truss bridges—one at Puta Creek, of 300 feet in length, the other across Ulatis Creek, or about eighty feet in length. The *soil* is generally a light, sandy loam, easy to excavate, and forming excellent embankment. The *land* in this division is exceedingly fertile, and many thousand acres of wild oats hay, — worth at the present time, forty-five dollars per ton in Sacramento, — grows, and is left to perish, because it will not pay for cutting and land carriage to market.

The *line* in this division is from one and one-half to two miles easterly of the main traveled road.

There will be about 350,000 *cubic yards* of embankment on this division.

THIRD DIVISION,

Extends from the Montezuma Hills to the village of Cordelia, a distance of twelve miles, or forty-five miles from the Sacramento River.

It will be remembered that the line first strikes the spur or slopes from the coast range, at the Montezuma Hills. Upon the first three miles of this division we have four curves of 5,730 feet radius, and an ascending and descending grade of twenty feet to the mile. Curving gently around the points of these hills, we fall into a more northwardly direction and run straight to or near Cordelia, about nine miles.

The *ground* over this part of the division is slightly undulating, but similar in its features to the last division, being mainly in embankment, of three to five feet. The *soil* is generally good, the highest grade not over twenty-one feet per mile, and but four curves, which are over a mile radius. The only *structures* of any importance are Suisun and Morse's Creek, which are crossed with about 160 feet of bridging.

There will be about 250,000 *cubic yards* of earth, and about 30,000 *cubic yards* of rock excavation on this division.

FOURTH DIVISION,

Extends from the village of Cordelia to the city of Benicia, being thirteen miles in length, or fifty-eight miles from Sacramento River.

The *line* curves to the south at Cordelia, and is carried at the base of the foot hills, keeping just above the margin of the swamp lands, around to Benicia. For the first eight miles, the ground is slightly undulating, being similar in character to the preceding division, the quantities averaging about 16,000 cubic yards per mile, generally in embankment.

Upon the remaining five miles, the foot hills become steeper, and

project more boldly into the marsh; we are compelled, therefore, to cut into them deeper, and will probably encounter rock excavation in most of them. The estimate for this portion of the work is liberal, and it is believed will cover its cost. The *line* will cross the marsh at several places between points of the hills, which are estimated to be filled up with solid embankment, leaving openings sufficient to allow egress of water.

There will be eleven curves on this division rendered necessary by following a sinuosity of the hills, the sharpest and only one having a radius of 1·900 feet, the others generally of large radius.

The *grade* is generally level. The character of the excavation is generally harder than upon the preceding divisions, but not what may be termed hard excavation. The most important *structures* upon this division are a bridge across Green Valley Creek of eighty feet span, and about 800 lineal feet of trestle work.

There will be about 365,000 *cubic yards* of earth and about 95,000 *cubic yards* of rock excavation on this division.

TABLE OF GRADES.

No. of Plane.	Length of Plane. Feet.	Rise per mile. Feet.	Fall per mile. Feet.	Elevation. Feet.	Descent. Feet.
1	51,650	Level.	Level.	0·00	·00
2	5,350	7·92		8·00	
3	8,000	5·28		8·00	
4	1,000	10·56		2·00	
5	3,500	21·12		14·00	
6	500	Level.		0·00	
7	4,000		2·64		2·00
8	14,000	Level.			
9	3,000	15·84		9·00	
10	500	Level.	10·50		
11	1,500		10·56		3·00
12	1,000	Level.			
13	6,000	2·64		3·00	
14	5,000	Level.			
15	2,000	10·50		4·00	
16	8,000	Level.			
17	4,000	5·28		4·00	
18	2,000		10·56		4·00
19	2,000	Level.			
20	1,500	7·92		2·25	2·25
21	1,500		7·92		
22	6,000		2·64		3·00
23	2,000	2·64		1·00	
24	4,000	Level.			
25	2,000	7·92		3·00	
26	8,000	Level.			

TABLE OF GRADES, — CONTINUED.

No. of Plane.	Length of Plane. Feet.	Rise per mile. Feet.	Fall per mile. Feet.	Elevation. Feet.	Descent. Feet.
27	1,000	5·28		1·00	
28	5,000	10·56		1·00	
29	2,200	15·84		6·00	
30	800		5·28		1·00
31	2,000	7·92		3·00	
32	4,000	10·56		7·00	
33	9,000	7·92		8·00	
34	1,000	Level.			
35	1,000	5·28		1·00	
36	2,000	15·84		6·00	
37	13,000		21·12		52·00
38	2,000	10·56		4·00	
39	1,000		15·84		3·00
40	4,000		7·92		6·00
41	9,000		5·28		9·00
42	6,000		10·56		10·00
43	4,000	Level.			
44	3,000		10·56		6·00
45	4,000	Level.			
46	3,000	10·56		6·00	
47	1,000	Level.			
48	2,000		7·92		3·00
49	10,000		21·12		37·00
50	1,000	21·12		4·00	
51	1,500	Level.			
52	2,500	10·56		5·00	
53	1,000	Level.			
54	1,000		5·28		1·00
55	4,000		21·12		16·00
56	60,400	Level.			

GRADES.

From the accompanying table of grades, it will be seen that three are fifty-six planes upon your Road, which may be classified as follows:

Of	*grades of*	2·64	*feet*	*per*	*mile,*	*there are*	3·41	*miles, or*	·06	*per cent.*
"	"	5·28	"	"	"	"	4·70	"	·08	"
"	"	7·92	"	"	"	"	5·18	"	·09	"
"	"	10·56	"	"	"	"	6·07	"	·10	"
"	"	15·84	"	"	"	"	1·55	"	·03	"
"	"	21·12	"	"	"	"	5·97	"	·10	"
"	"	Level	"	"	"	"	31·73	"	·54	"
							58·61 miles.		100	

Or, fifty-four per cent. of the line is level. Thirty-three per cent. of the line has grades of ten feet and under, while only thirteen per cent. is over ten feet per mile.

A first class freight engine of twenty-four tons weight will draw over your Road three hundred tons of freight.

The total sum of elevation to be overcome going northwardly, being only 150 feet; returning, 125 feet.

Comment upon the superiority of this as a Freight Road, is deemed unnecessary; the figures themselves present the facts in a light which argument cannot strengthen.

CURVES.

TABULAR STATEMENT OF THE CURVES AND TANGENTS.

No. of Curve,	Tangents, Feet.	Radius, 11,460 feet.	Radius, 5,730 feet,	Radius, 2,865 feet,	Radius, 1,910 feet,
1	2,900				
2		2,500 L.			
3	28,750				
4		2,000 L.			
5	31,100				
6		5,650 L.			
7	100,400				
8			1,700 L.		
9	200				
10			2,100 R.		
11	6,700				
12			4,250 R.		
13	600				
14			2,050 L.		
15	35,300				
16		13,400 L.			
17	6,000				
18		4,300 L.			
19	12,000				
20			3,000 R.		
21	6,500				
22		2,300 L.			
23	900				
24				1,800 R.	
25	2,200				
26		9,350 R.			
27	500				
28				2,000 L.	
29	3,400				
30		4,600 L.			
31	900				
32					3,600 R.
33	350				
34					850 R.
35	1,800				
36			1,100 R.		
37	2,300				
Total No. of feet, 309,350	242,800	44,100	14,200	3,800	4,450
Total No. miles, 58·62	Miles, 46·00	Miles, 8·35	Miles, 2·69	Miles, 0·74	Miles, 0·84

CURVES.

From the preceding tabular statement of curves may be gathered the following facts:

The whole length of Road is 58·62 miles.

There	is	of	straight	line	-	-	-	46	miles, or 80 per cent.
"	"	curves	of	11·460	feet	radius	8·35	"	14 "
"	"	"		5·730	"	"	2·69	"	04 "
"	"	"		2·865	"	"	·74	"	01 "
"	"	"		1·910	"	"	·84	"	01 "
							58·62		100

Eighty per cent. of the line being straight; fourteen per cent. curves of 11·460 feet, or over two miles radius—or ninety-four per cent. equal to a straight line. Of the remaining six per cent., four per cent. has a radius of 5·730 feet, or over one mile, making ninety-eight per cent. which may be run at the highest rates of speed. With these grades and curves, and a well-laid track, express trains can make the entire distance in any required time, not less than *one hour*.

ESTIMATES.

COST OF CONSTRUCTION.

In estimating the cost of constructing your Road, it will be fair to assume as a basis that manual labor will cost three dollars per day. Teams of two horses, including driver, $200 per month, or about seven dollars per day; that an ordinary day's work for a man is to excavate and wheel eight cubic yards of earth a distance of fifty feet.

Among the many remarkable peculiarities of California may be reckoned that of fluctuation of prices, extending to almost every article of trade or consumption; this is due to the rapidity with which wants are created, and the equal rapidity with which they are supplied; the want of foresight and sagacity inducing shippers to send too great a supply, creating thereby an overstocked market and a consequent depression of prices; the eagerness of shrewd speculators in buying up and controlling different articles in market for a rise.

The articles subject to these fluctuations in the construction of a Rail Road are principally lumber, iron, and grain consumed by teams employed on the Road. So large a quantity of lumber will be required for piling and trestle-work that it will be an object to go directly up the coast and contract directly with the heavy lumber manufacturers in the extensive timber localities in Oregon, at Humboldt Bay, or Mendocino, by which means it can be obtained at the lowest market prices.

It is also recommended that all the iron work for bolts in buildings, trestle-work, castings, &c., be procured at the East.

Manual labor and team work are also subject to great fluctuation. While at home, rail road labor is almost universally performed by Irishmen and Germans, in California a gang of working hands is composed of representatives from all nations — English, Irish, German, French, Italians, Portuguese and by no means a small portion of Americans, among whom may be found persons from all the walks of life — tradesmen, mechanics, professional men, sailors, laborers, &c., &c., thrown together incongruously.

Rail Road laborers are, firstly, those who have arrived here with too sanguine hopes and expectations, finding themselves deceived, remain about the principal cities and towns until their resources are exhausted, and they are compelled to work at anything that offers, by which they can earn a subsistence. These persons generally work no longer than they can get a few dollars ahead, when they either push on to the mines, or return to the cities to spend the few dollars they have earned.

Another, and by far the most numerous class of laborers are they, who having first tried the mines unsuccessfully, and impelled by dire necessity, retrace their steps towards the towns and cities, in hopes of finding employment in their legitimate business, or gaining enough to take them home. With few exceptions, the business community in cities and towns are persons who have previously tried mining unsuccessfully.

A third class of laborers are persons who own claims in the mines which can only be worked in the rainy season; these go about during the dry season and work for day wages.

Work carried on in the vicinity of mining precincts is liable to continual interruption, by the sudden departure of laborers, at news of new discoveries of rich diggings. Your line is not so near the mining districts that it will be much subject to these influences.

Teams are both difficult to procure and expensive, during the harvesting season.

Taking all these circumstances into consideration, the only safe way of estimating Rail Road work requiring this kind of labor, is to estimate it at its maximum price. So long as the mines will yield an average of three dollars for a day's work, no work of magnitude can be estimated with safety at a less price. The estimates of the cost of constructing your Road are so made, and are believed to be sufficiently high to cover all contingencies.

EMBANKMENTS.

Embankments are estimated to be fourteen feet wide at top, with slopes of one and one-half feet horizontal to one foot vertical. Excavations are twenty feet base with slopes of one and one-half to one. Piled Road is

estimated to be built in the most substantial manner, with a row of piles each ten feet.

TRESTLE-WORK.

A liberal amount of trestle-work is estimated to be built, as follows: A trench is first excavated the length of the sill, four feet wide, and of a sufficient depth. After being carefully leveled, the bottom is covered with three inch plank, laid crosswise; upon these rests the sill twelve inches square. Two posts, twelve inches square, are let into the sill with mortice and tenant, directly under the bearing of the rails—these posts are capped with ten by twelve timbers, nine feet long. Upon these caps rests a bolster or splicing timber twelve by twelve inches, and nine feet long. Stringers are laid upon these bolsters, and fastened with four bolts, of inch iron, passing down through both, making a solid continuous stringer. Upon these stringers are laid cross-ties, sawed three by eight inches, and eight feet long, upon which the rail is laid.

MASONRY.

From the difficulty of procuring suitable stone, masonry has been estimated only for the principal structures or bridges.

The culverts are proposed to be built with timber, similarly to the trestle-work, but in such a manner that they can be constructed of stone without interrupting the running of the Road. They will last with safety about five years, without repair. Should it be thought desirable to rebuild them of stone hereafter, they will require 1500 cubic yards of rubble masonry, which can be built (using the road to haul the stone over) for about thirteen dollars per cubic yard, or about $20,000.

As these will be generally open culverts, which, from their wooden string-pieces and wall-plates, must ever be of a partially temporary character; their ultimate construction with stone will be of doubtful expediency.

SUPERSTRUCTURE.

The superstructure is intended to be of a first class character, laid in such a manner that high rates of speed can be maintained with safety. The rail is estimated to weigh sixty pounds per lineal yard, laid with eight cross-ties, eight feet long, six by eight inches to each 18 feet rail.

EQUIPMENT.

The equipment is provided for quite liberally, and is sufficient to trans-

act the business of the Road up to its fullest capacity. The locomotive engines are proposed to be of the first class, with the variable link motion, and all the other modern improvements. Their estimated cost is sufficient to cover the expense of duplicate machinery, for all the parts which cannot be manufactured in this country. A set of duplicate parts for all the iron work of twelve cars is provided for, as also a set of tools, implements, &c., for repair of track.

BUILDINGS.

The buildings contemplated are full and complete in all particulars. The Machine Shop is estimated to contain all the different machines, lathes, &c., necessary to construct every part of a locomotive engine, except the driving wheels and crank shaft, duplicates of which are provided for. The sum of $25,000 is also estimated for wharfing at Benecia aud Sacramento.

RIGHT OF WAY.

The sum of $50,000 is estimated for Right of Way. It is more than probable that the entire right of way will be donated to the Company. Of the entire distance, one-half has been offered to the Company free of charge, and the utmost good feeling and enthusiasm prevails among the land holders along the entire line.

FENCING.

Fencing has been estimated for fifty miles in length of road. Although it may not be considered as indispensably necessary in this country, yet as express trains may have to be run rapidly and at night, and thousands of cattle are grazing along the line of Road, the damage arising from a single accident may cost the Company more than the entire expense of fencing. It has, therefore, been estimated as likely to prove of ultimate economy.

GRAVELING.

Graveling has been estimated the entire length of your Road, twelve feet wide and one foot deep. Although it might be dispensed with for a while, and is often left out on the score of economy, and a desire to reduce the cost of construction, yet experience has proved that it is an important essential in the elements of a good road. A Rail Road in this country is not subject to the severe frosts of a more rigorous climate, yet recent

experience has shown that earth becomes frozen, and that quite hard The heavy rains also experienced here, it is believed will render graveling not only desirable, but necessary; it has therefore been estimated.

BRIDGE.

With regard to a Bridge across the Sacramento river, at Sacramento city, it is believed that the wants of the traveling public will demand that connection should be had with the city of Sacramento by means of a Bridge; it has therefore been estimated. Its length will be nine hundred feet — its cost sixty-five thousand dollars, with timber piers of crib-work, filled with stone. In case a Bridge is not built, a Ferry will have to be maintained by the Company for the transaction of their own business.

ENGINEERING, SUPERINTENDENCE AND INCIDENTALS.

The sum of one hundred and forty thousand dollars is estimated for Engineering, Superintendence and Incidentals. This is intended to include all expense of Engineering department for surveys, location and construction, allowing eighteen months for construction of Road. All expense of Superintendence, salaries of President, Secretary, Treasurer, Commissioner, Agent, the expense of procuring right of way, the inspection of material, all traveling expenses, advertising, printing, books, stationary, office rent, fire, lights, and legal expenses.

CONTINGENCIES.

The sum of sixty thousand dollars is estimated for Contingencies, — the Engineering, Superintendence and incidentals being estimated separately, it is believed that no good reason exists for estimating a larger contingent fund.

ESTIMATE OF THE COST OF CONSTRUCTION.

GRADUATION.

1,665,000 cubic yards Earth excavation, at 45 cts ..	$749 250	
125,000 cubic yards Rock excavation, at $2.00, ..	250 000	$999 250

STRUCTURES.

8,000 lin. feet Piled road across tule, at $12, ...	$96 000	
1,500 lin. feet Trestle-work, at $12,.....	18 000	
50 Open culverts (timber) 150,000 ft. B. M., at $75	11 250	
40 pairs Cattle guards (timber) at $200, ...	8 000	
5,000 cubic yards Excavation of founda. at 50 cts., ..	2 500	
1,000 cubic yards Bridge masonry, at $40, ...	40 000	
670 lin. feet Truss bridging, at $40,.....	26 800	$202 550

SUPERSTRUCTURE (SIXTY-TWO MILES.)

5,642 tons (2,240 lbs.) T Rail (60 lbs.,) at $105,	$592 410	
36,332 Chairs of 12 lbs. weight, at .60 cts.,	21 799	
310,000 lbs. Spikes of 1-2 lb. each, at .10 cts.,	31 000	
146,320 Cross-ties, at $1 10,	160 952	
62 miles Track-laying & distributing, at $1,000	62 000	
Frogs, switches and crossing plank,	5 000	$873 161

EQUIPMENT.

10 Locomotive engines delivered at $11,000,	$110 000	
12 Passenger cars, at $3,000,	36 000	
4 Baggage cars, at $1,500,	6 000	
40 Platform freight cars, at $900,	36 000	
40 Box freight cars, at $1,000,	40 000	
12 set, 96 extra Wheels, 48 axles, at $500,	6 000	
20 Gravel dumping cars, at $500,	10 000	
7 Hand cars, at $250,	1 700	
7 Track repair cars, at $200,	1 400	
1 Notching machine, at $250,	250	
1 Wheel press, at $250,	250	
Tools for repairing track,	1 000	$248 600

BUILDINGS, ETC.

1 Passenger Building, Benicia,	$20,000	
1 Freight Building, "	10,000	
1 Engine House, 10 Engines, Benicia,	20,000	
1 Machine Shop, "	7,500	
Machinery and Fixtures for do. "	10,000	
1 Wood Shed, "	2,000	
Water Tank and Fixtures, "	1,500	
1 Turn Table, "	3,000	
4 Way Station Houses, at $2,500,	10,000	
4 Wood Sheds, at $1,000,	4,000	
4 Water Tanks and Fixtures, at $750,	3,000	
1 Passenger Building at Washington,	10,000	
1 Freight House, do	7,000	
1 Engine House, 5 Engines, do	12,000	
1 Wood Shed, do	2,000	
Water Tank and Fixtures, do	1,500	
1 Turn Table, do	3,000	
Wharfing at Benicia and Sacramento,	25,000	$151,500

RIGHT OF WAY.

Right of Way,	$50,000	50,0000

FENCING.

100 miles of Fence, 32,000 rods, at $2	$64,000	64,000

GRAVELLING.

147,000 cubic yards Gravelling, at $1,	$147,000	147,000

BRIDGE.

Bridge across Sacramento River,	$65,000	65,000

ENGINEERING, SUPERINTENDENCE, ETC.

Engineering, Superintendence and Incidentals,	$140,000	140,000

SUMMARY OF COST OF CONSTRUCTION.

Graduation,	$999,250	
Structures,	202,550	
Superstructure,	873,161	
Equipment,	248,600	
Buildings,	151,500	
Right of Way,	50,000	
Fencing,	64,000	
Gravelling,	147,000	
Bridge,	65,000	
Engineering and Incidentals,	140,000	
Contingencies,	58,939	
Total cost of Road,		$3,000,000

Making the total cost of your Road, fully built, equipped, gravelled, and fenced, $51,707 per mile.

The total average cost of twenty-five rail roads in the State of New York, as per report of State Engineer, for the year 1854, was $49,359 per mile. A portion of these, however, were double track roads.

It will be observed that while this is intended as a through route from San Francisco to Sacramento, no provision has yet been made for the transportation of passengers and freight from Benicia to San Francisco.

While it is important that this part of the route should be properly managed, that there should be large, speedy commodious boats, and and that the Rail Road passengers should be taken at low rates without delay, it is believed that it would be more advantageous for the Rail Road Company to contract with the present Steam Navigation Company, or with other persons of experience in that business, to transport their passengers and freight between San Francisco and Benicia at certain stated times, and at fixed rates per passenger and per ton of freight.

If a different line of policy is adopted, it will be necessary for the Rail Road Company to purchase and run two boats — a passenger and a freight steamboat, which will cost together $250,000.

The passenger boat will make two trips up and back per day, making

one hundred and twenty miles, and can be run at considerably less expense than the present passenger boats on the river.

The difference in the cost of transportation between rail roads and steamboats cannot be better illustrated than by comparing their expense in the present instance. While a rail road fifty-eight miles long, costing $3,000,000 is operated at an expense of $240,000 per year, two steamboats to do the same business upon a route one-half that length, costing $250,000, cannot be run in this country for less than a similar amount.

The present cost of running first class boats between San Francisco and Sacramento varies from $12,000 to $16,000 per month.

Perhaps a more economical arrangement would be, to run a passenger boat, costing say $125,000, to purchase a spare boat of a smaller class at a cost of, say $75,000, to use in case of accident or repair to the larger boat, and to purchase a steam tug and four or six barges, carrying 200 tons each, costing say,

1 Passenger Boat,	$125,000
1 spare do.	75,000
Steam Tug and Barges,	50,000
	$250,000

REVENUE.

In estimating the revenue of your Road, it is gratifying to be able to arrive so correctly at its probable business, from statistics of actual business now performed on the river by steamboats and sail vessels, without drawing upon the future, or looking to the increase of travel, from low fares and increased facilities.

The revenue of your Road will be derived as follows: from

1st. Through passengers from San Francisco to Sacramento, now carried by steamboats.

2d. Through Freight carried by steamboats.

3d. Through Freight now carried by sailing vessels.

4th. Way travel between Benicia and Sacramento.

5th. Way Freight between Benicia and Sacramento.

6th. U. S. Mails.

7th. Express Business.

It is proposed to confine the estimates of business to the amounts now actually carried between these points.

1st. The through passenger business between San Francisco and Sacramento, as now performed by steamboats. Two steamboats usually leave San Francisco for Sacramento at four o'clock each afternoon, arriving at from twelve to three, A. M. Corresponding boats leave Sacramento at

two, P. M., arriving at San Francisco at from nine to eleven o'clock, P. M. When business is brisk, often as many as four boats leave San Francisco loaded.—[See Appendix.]

It is obvious, if the number of passengers carried on these boats can be ascertained, that pretty correct data will be furnished for the through passenger business. From actual count of thirty trips made during the past year, and occasional published statements of number of passengers in the daily papers, it is found that they have averaged two hundred and thirty per day each way; about thirty of which have been Benicia, and two hundred through passengers; making a total per day of four hundred and sixty per day, or four hundred through passengers. Occasional trips are made with four hundred passengers on one boat; and not unfrequently eight hundred passengers have passed over the route both ways per day.

During the competition this last season between the Defender and the Steam Navigation Company, the latter run their regular first class boats at the usual fares, running the Surprise in competition with the Defender; the number of passengers was not materially lessened in the first class boats, while the Surprise and Defender, at low fares, scarce ever left the wharf with less than from two hundred to two hundred and fifty passengers each. During this competition it is estimated that not less than eight hundred passengers, on an average, passed over the route per day; occasional days they reached one thousand passengers, the increase being one hundred per cent.

It has been observed that the greatest number of passengers are carried for the two or three days immediately preceding and succeeding the arrival and departure of the ocean steamers.

The fares as charged by the California Steam Navigation Company during the past two years have been as follows: $10 Cabin, $7 Deck; $7 Cabin and $5 Deck; $6 Cabin and $4 Deck; $5 Cabin and $3 Deck; $3 Cabin and $2 Deck; $2 Cabin and 50 cents Deck; $1 Cabin and 50 cents Deck. Since the opposition has been withdrawn, the fares have gone up again, and are now $6 Cabin and $4 Deck. Freight has been $10, $7, $5, $4, $3 per ton. During the late opposition, there being freight enough for all the boats, the Steam Navigation Company have maintained the rate of $5 per ton, which they now charge.

2d. Through freight carried by steamboats.

The tonnage between San Francisco and Sacramento is shown by the Harbor Master's Report to be one thousand tons per day, for the past year. The enormous amount of 357,508 as tonnage, is reported officially by the Harbor Master. It will be observed, however, that while the steamers register their full tonnage — they do not always carry their full amount. Sailing vessels carry, usually, twenty-five per cent more than they register.

The following table exhibits the tonnage statistics from January 1st, 1854, to January, 1856, two years:

TONNAGE STATISTICS—1854.

PORT OF SACRAMENTO.

	Barks.....	Brigs.....	Schooners.	Sloops.....	Steamers.	Barges.....	Total tons.
January,	—	—	17	6	18	—	23,802½
February,	1	1	17	9	18	—	18,675½
March,	—	—	12	5	11	—	18,898½
April,	—	—	25	11	15	—	31,521½
May,	—	—	23	9	14	—	30,736
June,	—	—	19	9	15	—	29,637½
July,	—	—	20	10	16	—	25,555½
August,	—	—	19	13	14	—	28,195½
September,	—	—	26	17	15	—	27,274½
October,	—	—	25	19	16	—	26,475
November,	—	—	11	13	18	—	33,378½
December,	—	—	6	11	16	—	28,647½
Total,	1	1	220	132	186	—	322,926½

1855.

January,	—	—	4	8	12	—	26,699½
February,	—	1	8	14	10	—	21,969
March,	—	1	7	11	12	—	22,092
April,	—	—	19	20	13	—	28,430½
May,	—	—	29	27	15	1	27,087½
June,	—	—	33	35	15	5	31,471
July,	—	—	24	40	17	2	28,558
August,	—	—	29	31	16	2	37,581½
September,	—	—	25	36	16	2	33,623
October,	—	1	38	35	17	2	38,327
November,	—	1	37	26	14	—	31,271
December,	—	—	51	31	11	1	30,448½
Total,	—	4	304	314	168	15	357,058½

During the year 1855, there were 622 arrivals of sailing vessels, estimated to average 55 tons each, or ..... 35,000 tons.
313 days steamers, 400 tons per day, ... 125,200 "

Gives as through freight for 1855, ... 160,200 "

The way travel between Benicia and Sacramento is estimated at fifty passengers each way, or one hundred passengers per day.

The way freight upon the line of your Road will be considerable. Yolo county is the richest agricultural county in the State. She has a three-fold greater quantity of cultivated land within her borders, and raises more grain than any county in the State. She is so situated that during at least one half the year she is shut out from connection with the City of Sacramento by the water on the tule lands adjacent to the Sacraramento River, whereby she is obliged to force her produce into market before the winter rains; the consequence of which is an overstock, loss of control of the market, and consequent low prices, which does not benefit the community, but serves to enrich speculators, who, taking advantage of this state of things, buy low, hold a few months and then control the markets. Notwithstanding all these disadvantages, she raised last year 600,000 bushels of wheat, 800,000 bushels of barley and 120,000 bushels of oats. She raises not less than 50,000 tons of grain and hay, five-sixths of which will come into Sacramento, over 13 miles of your Road.

The products of Solano county, as per Report of County Surveyor for 1854, are as follows:

		Potatoes,.....	600 tons.
		Onions,.....	80 "
300,000	bushels	Wheat,.....	9000 "
240,000	"	Barley,.....	6000 "
15,000	"	Corn,.....	450 "
12,000	"	Oats,.....	170 "
			16,300

In addition to which she has a number of vessels constantly employed in carrying hay, &c., to Sacramento, which cannot fall short of 10,000 tons per year.

COST OF OPERATING.

The statistics as published in the United States do not furnish the proper data for estimating the cost of operating Rail Roads in California. It has therefore been thought advisable to make them up in a different manner.

	per Mo.	Am't. per Mo.		per Mo.	Am't. per Mo.
1 Superintendent,.....	$500	$500	2 Ticket Clerks,.....	125	250
1 Supd'ts Clerk, ...	150	150	1 Freight Ag't, Benicia	200	200
1 Receiver & Pay Master,.....	250	250	1 " " Sacramento, ...	200	200
1 Ticket Agent, Benicia	175	175	2 Freight Clerks,.....	125	250
1 " " Sacramento, ...	175	175	1 Master Mechanic,...	300	300
			1 Road and Car Master	250	250

	per Mo.	Am't. per Mo.		per Mo.	Am't. per M
4 Way Agents,.....	125	500	4 Helpers do.....	80	320
6 Way, Switch & Fr'ght Men, ...	75	450	3 Carpenters, ...	125	375
2 Pass. Conductors,....	200	400	3 Helpers do.	80	240
1 Freight "	150	150	1 Stationery Engineer,.	125	125
2 Pass. Brakemen.....	80	160	1 Fireman do.....	80	80
3 Freight "	80	240	12 Cords Wood, 360...	6	2160
3 Baggage Men,.....	100	300	Oil and Waste,.....		200
4 Enginemen, ...	175	700	Material for repairs,...		500
4 Firemen, ...	100	400	Advertising and Print'g		200
10 Freight Men,Benicia	75	750	Stationery, &c.,.....		200
10 " " Sacramento, ...	75	750	Salary Treasurer,.....		300
			" Secretary, ...		300
10 Wood Sawyers, ...	75	750	Office Rent,San Franc'o,		60
2 Porters & Lamp Men	80	160	Taxes, 2 per cent. on $1,500,000, ...		2500
2 Switch Men,.....	80	160	Contingencies,.....		250
6 Section Foremen,....	125	750			
30 Repair Men,.....	75	2250	Total per month,..		$19,905
3 Machinists,.....	175	525	Total year, ...		$238,860

.This is believed to be a most liberal estimate for the Road fully equipped, and doing business to its utmost capacity.

ESTIMATES OF RECEIPTS AND PROFITS.

It is assumed that your Road will carry two hundred through passengers per day, each way, or a total of four hundred through passengers per day.

Fifty way passengers per day, each way, or a total of one hundred per day are estimated.

Through freight is estimated at four hundred tons per day.

Way freight is estimated at one hundred tons per day.

It will be observed that while the law allows a tariff of $5.80 per passenger and $8.70 per ton of freight, that it is estimated at $2 per passenger, and $2 per ton of freight. It is believed that these prices are so much lower than the boats can afford to carry for, that it will prevent all competion. The present fares are $6 cabin and $4 deck, and $5 per ton. There is little doubt, however, that were the fare $5 upon both routes, that the saving in time by taking the Rail Road would secure three-fourths of the travel.

This estimate of receipts is based upon the assumption that the fare through from San Francisco to Sacramento will be $3, allowing $2 for the Rail Road and $1 for the boat.

146,000 through Passengers, at $2,			$292,000
36,500 way " at $1.50,			54,725
146,000 tons through Freight, at $2,			292,000
36,500 tons way " at $1.50,			54,725
U. S. Mails,			15,000
Express Business,			25,000
Total Receipts,			$733,450
Deduct in'st at 10 per cent. on $1,000,000 bonds,		$100,000	
Deduct Working Expenses,		240,000	340,000
Leaves nett Profits,			$393,450

Or say 20 per cent. per annum on $2,000,000 of stock.

The entire cost of your Road is estimated at $3,000,000. The capital stock is $2,500,000. It is proposed to issue $1,000,000 of ten per cent. Mortgage bonds, which will leave as a reserve fund, $500,000 in the Company's hands. This can be used in the purchase of boats, if thought necessary, or be held as a reserve contingent fund for other purposes.

In the estimate of cost of operating the Road, will be observed the sum of $30,000 per year for taxes. This may seem excessive, to persons residing in the Atlantic States, but will be readily understood by California property holders. The city, county and State taxes in the City of Sacramento amount to five and one-half per cent. this past year.

Two daily passenger and two freight trains per day, each way, will be necessary to perform the business of the Road.

The passenger boat leaving San Francisco at seven, A. M., meets at Benicia a morning train from Sacramento (starting at the same time.) Exchanging passengers and baggage, they both return, reaching their respective destinations at half past ten, A. M.

Leaving again at half past three, P. M., the boat meets the afternoon train from Sacramento, (leaving at the same time) at Benicia, and returning, reach their destinations at seven, P. M. This gives passengers an opportunity to breakfast on board the boat, and reach either city by half past ten, A. M., giving them nearly the whole of the business hours of the day to themselves. Returning they have an opportunity for dinner on the boat, and reach either city in time to attend to either business or pleasure in the evening.

A freight boat, with two barges might leave San Francisco at twelve, noon, arriving at Benicia at half past two, P. M; return at nine, P. M., arriving at San Francisco at half past eleven, P. M. The freight upon the two loaded barges at Benicia, could be transferred by day-light, and an evening freight train leave Benicia at seven, P. M., arriving at Sacramento at half past ten, P. M. An accommodation train, taking back the empty freight cars, with passenger car attached, might leave Sacramento at

six, P. M., arriving at Benicia at eight and three-quarters, and there taking freight boat, arrive in San Francisco at half past 11, P. M.

GENERAL REMARKS

Your Road will run through the northern edge of a large body of wood land, about ten miles from Sacramento. The grove contains about twenty-five hundred acres of cottonwood and oak timber. This wood is delivered at Davis' Mill on the Puta—cottonwood for three dollars, and oak for five dollars per cord; it can be cut and piled along the line of the Rail Road for even less than these prices. Mr. Davis prefers the cottonwood to make steam, although it will not go quite so far as oak.

This wood will cut at least one hundred cords per acre, or say, two hundred and fifty thousand cords. Your wants will require about five thousand cords per year. A supply for ten years could be cut from this grove without making much of an impression upon it.

It is believed that about one-fourth of this grove is owned by holders of Spanish Grants, the balance being either Government land, pre-empted or squatted upon. The number of land-holders, through whose land the Road passes, is comparatively small.

From the western bounds of Washington, the line runs for seven miles upon overflowed land belonging to the State. The farms of Riggs, Brown and Davis carry the Road four miles further to the Puta; it is believed that all these gentlemen will release to the Company free. From Puta Creek the line passes for twenty miles to the Montezuma Hills, over the Vacca or Barker Ranch and Government land. The next ranch is owned by Capt. Ritchie, and the remaining ten miles by General Vallejo and Captain C. P. Stone, all of which gentlemen will release to the Company free. The land required through the city of Benicia will probably be donated to the Company.

Your Road will connect at Sacramento with the Sacramento Valley Rail Road, which is built and running to Negro Bar, upon the American river. Seventeen additional miles of this Road are under contract, which, when completed, will secure, in addition to the El Dorado county business, all the business lying between Placerville and Nevada.

It is proposed to extend this Road along the foot hills, eventually, as far as Shasta. The Shasta business is itself acquiring an importance which must be seen to be appreciated. The following is extracted from the *Shasta Republican*, and will undoubtedly be of interest:—

"Seven hundred tons of merchandise are delivered in Shasta monthly. One house receives one hundred and fifty tons. For the transportation of freight, nearly all of which comes from San Francisco, seventy dollars

per ton is paid. In other words, forty-nine thousand dollars is paid monthly, or five hundred and eighty thousand dollars yearly by the merchants, and charged to freight. In the above estimates, the goods bought in the cities below and shipped direct to their various destinations in Shasta, Trinity and Siskiyou counties are not taken into account. With these the amount of freight passing over the road leading to Shasta would amount to one thousand tons, and the amount paid therefor, seventy thousand dollars per month, or eight hundred and forty thousand dollars per year.

"The amount paid for the transportation of grain, hay, potatoes and various other products of the Sacramento Valley is not included. No less than thirty thousand dollars per month, or three hundred and sixty thousand dollars per year are paid by passengers, arriving and departing, to the California Stage Company. The immense sum of one million two hundred thousand dollars in hard cash, is therefore annually expended for the transportation of goods and the carriage of passengers to Shasta. With these figures," continues the *Republican*, "business men and capitalists will soon begin to think of a Rail Road. A more feasible route for such an enterprize," says that paper, "does not exist than can be found between Sacramento or Marysville and Shasta."

The *Republican* concludes as follows: "A road of two hundred miles in length over the route indicated, would cost about six millions of dollars. Nature has furnished us with a most perfect grade almost the entire way, and man has little else to do, save to supply the material and place it on the ground. Without any increase either of trade or population, our freight bills and passage money would pay for the Road in four or five years."

It should be borne in mind that probably as many passengers travel over this route on foot, or in wagons, at a reduced fare, as travel in the Stage Company's coaches, who would take a Rail Road at moderate rates of fare. There is still another feature with regard to the trade of Upper California, not generally understood; while a considerable amount of merchandize is carried by wagons *via* Shasta to the northern part of California, a larger amount, by far is transported thither by means of vessels to the various ports on the Pacific coast, and pack trains across the mountains, all of which would take the Sacramento Valley route were a Rail Road completed to Shasta. That this trade is large and important, is beyond dispute, and it is to be regretted the actual statistics of the whole of this business cannot be obtained. The following extract, from the Crescent City *Herald*, gives the amounts of merchandize discharged there during nine months of the past year, nearly all of which is packed across the mountains into Upper California, costing for freight from sev-

enty to one hundred dollars per ton. This would give four thousand eight hundred and fifty tons for the year, costing for freight, at eighty-five dollars, four hundred and twelve thousand two hundred and fifty dollars.

Crescent City Trade.—The Crescent City *Herald* gives the following amounts of merchandize discharged at Crescent City during the various months of this year:—

September,	443	tons.
August,	773	"
July,	378	"
June,	508	"
May,	560	"
April,	520	"
January, February and March,	465	"
Total for nine months,	3637	tons.

This is but one of the ports upon the coast. The other principal ports are Humboldt, Eureka, Union and Trinidad, in California, and Port Orford and Portland, in Oregon. Their population is as follows:

Union,	350
Humboldt,	
Eureka and Bucksport,	
Trinidad,	100
Crescent City,	500
Port Orford,	50
Portland,	2000

It is believed that at least fifteen thousand tons of merchandize and freight are yearly packed from these ports into Upper California and Lower Oregon, costing over a million of dollars for freight, nearly the whole of which would take the Sacramento Valley route were a Rail Road completed to Shasta.

Another and most powerful argument in favor of the construction of your Road is found in the fact that the Sacramento River is gradually filling up from the immense wash of material brought down by mountain streams in the mining regions. That this fact is disputed and denied by those whose interest it is to believe the contrary, is true, but the simple denial of the fact does not disprove it.

In 1850 the waters of the Sacramento ran clear; since the mining operations have commenced, they have been, without cessation, thick, turbid, muddy and discolored. This is not strange, when it is considered that every stream, spring and ravine leading into the rivers forming, and into the Sacramento itself, is led off and diverted in every direction for the purpose of washing auriferous earth. Hills, mountains and plains are re-

moved by the agency of this water, and tumbled into the rivers. The accumulation of tailings at the end of a sluice box affords a fair indication of the vast accumulation of material which must find its way into these rivers, viz: the Upper Sacramento, Feather, Yuba, Bear and American.

The Yuba River, at Marysville, has filled up and fallen off so rapidly that boats drawing 18 inches of water have not been able to land within a mile of the City for the past six months. So alarming has this become, that the Marysville papers do not hesitate to predict the complete stagnation of business in the City, unless some measures are taken to connect them with some navigable point on the river, by means of a Rail Road. For the correctness of these statements, the reader is referred to the Marysville papers of the past season. The following extract is given from the Marysville *Express*, of recent date, copied into the Sacramento *Union:*

"The Yuba.—The Marysville *Express* says, that the Yuba river is on the rise, and it hopes soon to be able to announce the arrival of steamers at their old landing. During the summer and fall the Embarcadero has been at a point on Feather River, near the mouth of the Yuba, nearly a mile below the City."

The following is extracted from the Municipal Message of Mr. Hartley, Mayor of the City of Marysville, recently delivered. In relation to the navigation of the Yuba, he says:

"The experience of last year will convince you that the Yuba River is not to be relied on for more than six months in the year for purposes of navigation; the numerous canals and ditches leading from it into the mining and agricultural grounds, is constantly reducing the volume of water. We should not regret this, inconvenient as it may appear now, for the success of our mining and agricultural neighborhood is our only source of prosperity, in a commercial point of view.

In this connection I will observe that the Council will hereafter find themselves compelled to establish a public landing at some convenient point on Feather River, to enable us to derive our usual revenue from from the landing tax.

Rail Road communication with the Bay of San Francisco or Sacramento River will eventually be demanded by our people; but there is little doubt that the sagacity of our citizens will direct how and when the work shall be accomplished, without the aid of the Council."

The American River during the past year has not only diminished in volume, but filled up to such an extent that actual observation is needed to convince one of the fact. Particular localities have filled up as much

as eight feet, and localities can now be pointed out on the Sacramento River, below Sacramento, which are now shoal for two hundred feet from shore where formerly was deep water.

The Sacramento River is tortuous, winding and sluggish and difficult of navigation in the season of low water; during the low, and it may be said, even in ordinary stages of water, first class boats strike on the Hog's Back bar, on almost every trip, and when the tide is low are pretty certain to lie there two to four hours. Were it not for tide, first class boats could not navigate the Sacramento River for six months in the year.

To an unprejudiced observer the difficulties of Sacramento River navigation afford no ground for wonder or astonishment: particles of matter projected into a moving body of water, whose specific gravity is less than their own, simply obey the laws of nature when they sink to the bottom.

Bars are formed by deposits of particles of matter, which, borne up and carried by swiftly running waters, gradually sink when the stream becomes sluggish and loses its rapidity, and accumulate by degrees, until they finally become bars.

The bar at Hog's Back, and its neighbors, the wide range of shallow banks in the river below, and in Suisun Bay were probably thus formed, and the continuation of the same process, although it cannot close the river, yet will so impede and obstruct its free flow as to render Sacramento River navigation more difficult, if not impracticable for large boats. How long or short a time will elapse before this event takes place, is difficult to determine, but the recent removal of some articles opposite the Pacific Mail Steamship Company's Works, as low down as Benicia, shows an accumulation of three feet to have taken place there.

The following extract is from the Sacramento *Tribune*, of Jan. 12, 1856:

"Filling up the River.—The *Alta* says that a distinguished naturalist and geologist gave it, a few days since, as his opinion, that in a very few years the Sacramento River would be filled up by the deposites of its tributaries; that it would not be navigable, except for the very lightest draft boats, and that, finally, its navigation would be entirely prevented. The constant washings of earth which are borne into the American and Feather Rivers from the thousand streams, ravines, ditches and canals, and by these rivers carried into the main Sacramento, are already having a perceptible effect."

With the fact of the loss of navigation at Marysville before us, and that, too, so suddenly and unexpectedly; with the knowledge that the American River has filled up alarmingly, and is daily pouring its deposits into the

Sacramento River with the undisputed acknowledgment of the difficulties of Sacramento River navigation during a large portion of the year, and the knowledge that new and more extensive ditches and canals are being constructed, and a rapid increase of mining operations carried on in the mountains each successive year, it is neither unwise nor unfair to assume that the City of Sacramento may, at no very remote period, find themselves in a situation precisely similar in character to that of their sister city. It is believed that this argument alone, ought to be sufficiently powerful to induce the City of Sacramento to construct this Road herself, if it could be built by no other means, thereby placing herself beyond the possibility of being subjected to so unpleasant a contingency.

The City will undoubtedly grant every facility and do every thing in her power to aid your Road, and in view of the present immediate advantages, no less than the great ultimate benefits to be derived, should—and it is believed, will—contribute liberally to the California subscriptions for stock.

There is still another light in which your Road may be viewed, which adds additional importance to and argues still more forcibly in favor of this enterprize. It is its connection with the great Pacific Rail Road. This subject has been a fruitful source of discussion and has for a long time engaged the attention of many distinguished individuals, both here and at the East.

While the partisans of the various localities differ as to the merits of their respective routes, all concur in the great importance and absolute necessity of the early construction of this great work. The limits of this report will not admit of a discussion as to the relative merits of these routes, but if built upon any but the Southern route, your Road will be the grand avenue of approach to the metropolis of the Pacific. Viewed in this connection, it assumes an importance which will not fail to commend it to the attention of all clear thinking and sagacious men, and there is no doubt but if proper exertions were made in the right quarter, that the aid of Government would be cheerfully extended to facilitate the construction of this, as of all other Roads in California tending to hasten the completion of the great Pacific Rail Road, by a donation of public lands for the public good.

That the side excavations along the line of your Road through the tule lands will reclaim a large quantity of overflowed land, belonging to the State, is undoubtedly the case; it is hoped that this consideration will dictate a wise and liberal policy on the part of the State toward the prosecution of this enterprise.

In conclusion, it is worthy of remark, that to your hands is confided the control of the future workings of an enterprize which will exert a most

powerful influence over the development, advancement, growth and business of this State.

Its advantages are briefly enumerated as follows:

1st. A saving of thirty-two miles distance on the great inland thoroughfare.

2d. A deduction of time, from eight and a half to three and a half hours.

3d. A permanent reduction of fare from six to three dollars, or one hundred per cent.

4th. A corresponding reduction of time and expense on freight.

5th. Ability to carry passengers to either city, giving them five to six hours of the business part of the day there; return, and give them the evening to themselves in either city.

6th. Development of the country along the line of the Road.

7th. A market for Yolo county produce at any and all times.

8th. A market for products of Suisun and adjoining valleys.

9th. Giving a permanent value to wild oats hay along the line of the Road, now valueless.

10th. No grade over twenty-one feet per mile.

11th. Ninety-four per cent. equivalent to a straight line, ensuring ease, comfort, rapidity and safety.

12th. Reclamation of tule lands.

13th. A means of communication between the two cities when the river fills up.

14th. An annual saving of over one-half a million dollars to the traveling public and traders between the two cities.

15th. Increased facilities to the traveling public.

16th. And lastly, its importance as the beginning of the end of the great National Rail Road.

I take this opportunity of expressing my obligations to Messrs. Watson and Bradley, Assistants, for the able and satisfactory manner in which they performed the duties assigned them. Also to Mr. Deetkin, Leveller and Draughtsman, for the correctness of his instrumental work, and the neatness and accuracy of the maps and profiles, &c. Also, to Mr. Jerome C. Davis, of Yolo Co., for the uniform courtesy extended by him to the surveying party.

Your indulgence is solicited toward any imperfections, or omissions, or errors which this Report may contain, arising from want of time in preparing the same.

THEODORE D. JUDAH,
Chief Engineer.

APPENDIX.

DESCRIPTION OF SOLANO COUNTY.

Extracted from the Governor's Message, accompanying Census of 1852.

Suscol Valley, west of Suscol Hills, runs from the city of Vallejo to the northern part of the county; eight miles in length and three in width, — Napa Bay washing its whole length. Growth, wild oats, of luxuriant growth; well adapted to farming; a desirable and interesting portion of the county.

Sulphur Spring Valley, runs up from Suisun Bay, two miles north of Benicia, from one hundred to four hundred yards wide; winds through the Suscol Hills for five or six miles; soil rich and well watered.

Green Valley, lies east of the Suscol Hills, four miles east of Suscol Valley, six miles in length, one and one-half in breadth; large portion always green, hence its name. Navigation excellent from interior; south end the terminus of the great Sacramento Valley. Well adapted to agriculture, and covered with wild oats, evergreen grass, and red clover.

Suisun Valley, north of Suisun Bay, and east of Green Valley, six miles square, covered by a Spanish grant; opens out on the east into the Sacramento Valley; soil exceedingly fertile, much cultivated. Navigation excellent; five hundred tons of hay ready for shipment, five hundred tons barley, also; six vessels constantly taking produce from the embarcadero; hay consists chiefly of wild oats and clover.

Ulattis Valley, lies further to the north-east, five miles in length, and one and one-half in width; runs west between two ranges of hills, and opens out into the Sacramento Valley; a great thoroughfare, and the admiration of all travelers.

Sacramento Valley extends as far as the eye can reach, covered with wild oats, and not subject to inundation.

Streams. — Puta River, ten miles north of Ulattis Valley, the northern county line, not navigable, affords abundant water for stock, which resort to it in great numbers; rises in the mountains, winds through a rich, lively, fertile plain twenty miles, and loses itself in the extensive tules, which lie between the Plains and Sacramento River. Western part of the county mountainous and very interesting; many small valleys well adapted to stock raising.

Sacramento River, well adapted to farming and grazing purposes.

Extract from report of H. Patton, County Surveyor, to S. H. Marlette, Surveyor General. November, 1854.

SIR:

I now communicate the result of my examinations and enquiries in reference to the subjects adverted to in your circular. First. In reference to the aggregate quantity of land belonging to the State, my estimate is that there are about ninety-two thousand acres of tule land attached to this county, which I think is susceptible of being redeemed at no very great expense, as the tide never rises over it but a few inches; an embankment two feet high would secure almost the whole of it from the head of Suisun Bay down. There are fifty thousand acres of other lands subject to overflow at every excessive rise in the Sacramento River. This land seems to me more difficult to bring into useful or profitable occupation. Of the five townships of land which are sectioned in this county, I estimate that there about forty quarter sections adjoining the tule, where the greater portion is tule, and consequently belonging to the State, which I think the Surveyor General has surveyed into fractions so as to deprive the State of their right thereto. I may be under a misapprehension on this subject. The lands I consider among the most valuable in the State, and if I am right, are certainly worth looking after. My estimate of the area of the entire county is equal to nine hundred and six square miles, or five hundred and eighty thousand acres, of which I set down as tule, ninety-two thousand acres; of mountain and hill land, one hundred and fifty-three thousand acres, mostly susceptible of being used for grazing purposes; two hundred thousand acres as susceptible of profitable tillage; and ninety-two thousand acres rendered valueless by inundation, sterility and other causes; and forty-three thousand acres of water surface.

Of the tule land, that adjoining the Suscol rancho is claimed by the proprietors thereof, but I do not think any of the rest is. The amount so claimed, I think is probably about eleven thousand acres. I think about one hundred and thirty thousand acres of land is covered with timber, some of it densely, other portions more sparsely. About four hundred thousand acres of the entire area are claimed by Spanish grants.

I estimate the entire amount cultivated at seventeen thousand acres, of which I suppose ten thousand acres wheat, six thousand barley, five hundred corn, three hundred vegetables, two hundred oats.

The yield per acre I estimate as follows:

200 acres of Potatoes, 3 tons per acre	600 tons.
40 acres of Onions, 2 tons per acre	80 tons.
Wheat, 30 bushels per acre	300,000 bushels.
Barley, 40 bushels per acre	240,000 bushels.
Corn, 30 bushels per acre	15,000 bushels.
Oats, 60 bushels per acre	12,000 bushels.

It is to be regretted that the authorities of Yolo County have furnished the Surveyor General so meagre and unsatisfactory a statement of the statistics of that County, it being the most prolific County in the State.

Yolo County is the richest agricultural County in the State. Although not a large County, there is three-fold the quantity of cultivated land within

her borders, than within any County in the State. She is so situated that during at least one-half of the year she is completely shut out from connection with the City of Sacramento, by the water on the tules adjacent to the river; with all this disadvantage, she raised this last year six hundred thousand bushels of wheat, eight hundred thousand bushels of barley, and one hundred and twenty thousand bushels of oats. She raises not less than fifty thousand tons of grain and hay, more than three-fourths of which will come into Sacramento over thirteen miles of your Road.

In the absence of official statistics of Yolo County, a brief description of one or two farms through which the road runs may give some idea of the balance of the farming lands in the County. After leaving the tule the line passes through the farms of Riggs, Bailey, Brown and Davis.

The farm of Mr. Jerome Davis lies on the north side of Puta creek, in Yolo County. The following description is an extract from the report of Committee on Farms, Vineyards and Orchards, to the California State Agricultural Society.

The Committee on Farms, Vineyards, Orchards, Nurseries, etc., in the discharge of the duties assigned them, proceeded on the 12th of September last, to the farm of J. C. Davis, Esq., situated on Puta river, and distant from Sacramento twelve miles.

Mr. Davis' ranch embraces about eight thousand acres of land, one thousand of which are enclosed with a good substantial fence. Upon this ranch are a large two-story commodious house with piazzas, and a steam flouring mill containing two run of stone, and capable of flouring three hundred bushels of wheat in twenty-four hours. The machinery of the mill also raises water for irrigation, and supplies the wants of his house and barn. The water is first raised into a large iron tank, holding five thousand gallons, and is thence distributed, by the arrangement of pipes, as required. Blacksmith and carpenter shops, with requisite tools for the accommodation of the various wants of the farm and mill, constitute a part of the ranch buildings. The arrangements of the dairy house are admirable, and well adapted to its uses; a large barn, 60x90, and well arranged; corrals, large and convenient, add to the improvements already mentioned. There are upon the ranch, four thousand grape vines, three years old; five hundred peach trees, and of other kinds of fruit trees, three hundred. There were three hundred acres of wheat and oats grown upon the ranch this season, of good quality, and it has a fine thrifty locust grove, containing ten thousand trees, one year old from seed, and are eight feet high.

The stock upon the ranch consists of three thousand head of cattle, six hundred of which are American, the balance being California stock. Three hundred American cows comprise the dairy stock, and seventy-five horses and mules make up the stock of harness and saddle annimals. Mr. Davis has four thousand sheep, and hogs, poultry, tools and implements of husbandry corresponding to the requirements of the ranch. Seven hundred calves were raised last year. The cost of wood delivered at Davis' Mill, is three to five dollars per cord.

The soil is a dark rich loam, with a sufficient admixture of other quali-

ties to peculiarly adapt it for remarkable growths of grain, grass, etc. It is free from the excesses of wet and drought, and not liable to bake and crack. The entire absence of rust during the two last seasons in that locality, while it prevailed to an alarming extent in many other portions of the State, commends it as a desirable wheat-growing section.

From Davis' ranch we proceeded up the Puta river to Wolfskill's ranch, at the foot of the first of the Coast Range of mountains. The evidences remaining of the extent and quality of crops grown upon the farms intervening between Davis' and Wolfskill's were gratifying and encouraging to the California agriculturist.

At Mr. John Wolfskill's we found forty acres enclosed, and containing eight thousand grape vines, six thousand of which are in bearing; one hundred and fifty peach trees, seventy of which are in bearing; eighty pear trees in bearing; and apricot, quince, peach, English wahut, chestnut and almond trees, in vigorous growth.

The bearing trees are mostly seedlings. The location is excellent; it can hardly, in fact, be surpassed, and will, with the efforts that are being made for the improvement of its fruit, soon occupy a position among the finest orchards of the State. The grasshoppers nearly destroyed his vineyard as well as seriously injured other fruits and trees.

He irrigates with water raised by steam from Puta river. His ranch embraces seventeen thousand acres, and he has two thousand five hundred head of horses and cattle.

From Wolfskill's our course took us along the foot hills, south, into and through Vacca Valley, into Suisun; thence crossing to Suscol, and stopping at the Messrs. Thompson's, who have five hundred acres enclosed, and nine thousand trees in orchard, as follows: one thousand five hundred apple, of thirty-five varieties; fifty cherry of eighteen varieties; fifty pear of forty-one varieties; one hundred plum, of twenty-seven varieties; two hundred and fifty apricot, of six varieties; seven thousand peach, of thirty-four varieties. Three hundred of these are bearing trees; the fruit planting was done in 1853. In addition to the orchards, these gentlemen have forty thousand trees in nursery, of which thirty thousand are peach, the remainder being apricot, nectarine, apple, plum and other varieties They have five thousand Los Angeles grape vines in their vineyard, and two thousand five hundred in the nursery, of improved culture.

The farm of General Hutchinson, next above Mr. Davis, on Puta creek, yielded forty thousand bushels of wheat last year. There are now some twelve hundred acres of wheat, besides barley and oats on the farm. Wild oats grow spontaneously in the greatest luxuriance on these lands, the hay of which is now worth fifty dollars per ton in Sacramento; many thousands of tons grow and perish upon the line of the road, as they will not pay for transportation to market.

Extracts from the Sacramento Union.

Sacramento Union, July 3d, 1854.

On Saturday there was left in our sanctum, a bunch of plump, bald wheat, grown on Hartroughs Farm, on Caché Creek, Yolo county, which consists of one hundred and forty-four stalks, all the product of a single grain of wheat; the fecundity of this grain surpasses anything we have yet heard of, even in the rich agricultural county of Yolo.

Sacramento Union, July 11th, 1854.

A large drove of cattle, numbering four hundred and twenty-five head, crossed the river yesterday for the ranch of Messrs. Bucham & Hueston, in Yolo county. Another detachment of four hundred and fifty head will follow in a day or two. Yolo must be fast filling up with stock, and bids fair to be a large cattle-raising county.

Sacramento Union, August 22d, 1854.

Mr. Daniel McGowan, whose ranch is situated on the Yolo side of the river, three miles from town, has left with us a monster specimen from his garden of sixteen acres of watermelons. The sample before us measures four and one-half feet in circumference.

Sacramento Union, August 18th, 1854.

One hundred and twenty-one head of cattle arrived in this city yesterday, and crossed to Yolo county. Yolo bids fair to assume a prominent position among its sister counties, in the wealth of its cattle.

Sacramento Union, September 18th, 1854.

Mr. G. F. Brown, of Puta, left this city with a train of pack animals, for Carson Valley, from which place he will return with between four and five hundred head of cattle awaiting him.

Sacramento Union, October 9th, 1854.

A respectable drove of cattle, numbering one hundred and seventy head, crossed the Sacramento, *en route* for Puta. Who can furnish us with the statistics of the stock of Yolo?

Sacramento Union, October 28th, 1854.

Mr. Thomas West and family arrived yesterday from Davis county, with a drove of one hundred and twenty-six head of cattle, having lost thirty-eight on the way. The train of Captain Joseph R. Childs, of Napa, including one hundred and fifteen head, took the same direction.

Daily Union, April 3d, 1855.

A splendid drove of cattle, numbering two hundred and fifty head, the property of Messrs. Barber & ——, crossed the Yolo Ferry yesterday, *en route* for Puta.

Union, January 16th, 1855.

A drove of cattle, numbering eight hundred and sixty-three head, crossed the ferry to Yolo yesterday, &c., &c.

The foregoing extracts might be abundantly multiplied, but are only given to endeavor to show the increasing importance of the Yolo county trade.

A few extracts from the Sacramento papers, showing the amounts brought up by boats, corroborate the estimate:

Sacramento Union, Jan. 18, 1854.

The steamer Senator brought up two hundred and four tons of freight on Thursday evening.

Sacramento Union, Jan. 19, 1854.

The Confidence brought up one hundred and thirty tons of freight on Tuesday night.

SACRAMENTO UNION, July 11, 1854.

The Helen Hensley brought up one hundred and sixty tons of freight, and the Confidence the same amount on Tuesday morning.

SACRAMENTO UNION, Oct. 2, 1854.

The Helen Hensley brought up two hundred and five tons of freight on Sunday morning. The Bay boats, on Friday, brought up three hundred and twenty tons freight.

SACRAMENTO UNION, Oct. 9, 1854.

The boats, on Sunday morning, arrived from the Bay crowded with freight.

SACRAMENTO UNION, Oct. 21, 1854.

On yesterday, six hundred tons of freight were discharged from the steamers Confidence, Helen Hensley, and American Eagle.

SACRAMENTO UNION, Oct. 26, 1854.

On yesterday, the Confidence landed one hundred and seventy-five tons, the Helen Hensley two hundred and twenty-five tons, and left sufficient freight on the wharf to freight the American Eagle.

SACRAMENTO UNION, Oct. 28, 1854.

The Helen Hensley brought up two hundred and twenty, and the Confidence one hundred and sixty, tons of freight.

SACRAMENTO UNION, Nov. 6, 1854.

The steamer bound up with freight on Saturday night, remained some time at Benicia, owing to the prevalence of a dead ebb tide. The Confidence and New World grounded on Hog's back, the latter remaining an hour or more on this delectable spot.

SACRAMENTO UNION, Nov. 9, 1854.

Yesterday was a busy day at the Levee, in consequence of the arrival of the four steamers, the Confidence, New World, Queen City, and Helen Hensley, with upwards of one thousand tons of freight.

The Queen City brought but about two hundred tons, much less than her capacity, on account of the unfinished state of her hoisting apparatus. A large amount of freight offered was necessarily refused.

SACRAMENTO UNION, Nov. 13, 1854.

On Sunday morning, the H. Hensley brought up three hundred tons of freight, the Confidence also had one hundred and sixty tons, the New World one hundred and eighty, and the Queen City one hundred and seventy tons. Total, eight hundred and ten tons.

SACRAMENTO UNION, Dec. 14, 1854.

The Queen City brought up, yesterday morning, upwards of two hundred passengers, besides two hundred and fifty tons of freight, fifty of which was transhipped to Marysville.

SACRAMENTO UNION, Jan. 4, 1855.

The Wilson G. Hunt and H. Hensley brought up three hundred and seventy tons of freight yesterday morning.

SACRAMENTO UNION, Jan. 5, 1855.

The steamer Eclipse brought up, yesterday morning, four hundred tons of freight.

SACRAMENTO UNION, Feb. 3, 1855.

The steamer Queen City brought up three hundred and thirty five tons of freight and one hundred and eighty passengers on Saturday night, and was obliged to decline one hundred tons of freight for want of room.

Sacramento Union, March 16, 1855.

No less than twelve sail vessels were counted on the line of levee yesterday, discharging flour, barley, wheat, wood, coal, etc.

Sacramento Union, March 19, 1855.

The steamer Queen City arrived yesterday morning, with an unusally large load of passengers, and two hundred and forty tons of freight.

Sacramento Union, May 3, 1855.

No less than six hundred and ten tons of merchandise was brought up on Tuesday night, as follows: New World, two hundred and ten; W. G. Hunt, one hundred and eighty, and Queen City, two hundred and twenty tons. The Queen City also brought up one hundred and sixty-five tons for Marysville, and although she did not leave San Francisco till 6 P. M., was compelled to decline receiving freight at 3 P. M. The other boats also left a surplus of freight on the wharf.

Sacramento Union, May 5, 1855.

The Queen City brought up, on Thursday night, three hundred and fifty-two tons of merchandise, the New World two hundred and thirteen, the W. G. Hunt one hundred and sixty; making six hundred and ninety-five tons landed at the levee yesterday.

Sacramento Union, May 19, 1855.

On Tuesday night, the steamers alone brought up an aggregate of five hundred and eighty-five tons; in addition to this, will be seen elsewhere in this column, that a fleet of sail vessels arrived, many of which were freighted with assorted cargoes.

On the same trip, the receipts of the Queen City, for passage money alone, amounted to $1,200.

Sacramento Union, June 4, 1855.

The propeller Martin White arrived at the levee at 2 P. M., having in tow the barges Adelaide and Pilgrim, with an aggregate freight of three hundred tons.

Sacramento Union, June 7th, 1855.

The Queen City arrived with two hundred tons of freight.

Sacramento Union, June 14, 1855.

The propeller Martin White arrived with two hundred and sixty tons of merchandise.

Sacramento Union, June 16, 1855.

The propeller Martin White arrived with two hundred and seventy-one tons freight.

Sacramento Union, June 21, 1855.

Arrived, steamer Ellen Craig, seventy-eight tons merchandise and one hundred and twenty-three passengers. June 20, propeller Martin White, with one hundred and forty-fivee tons of merchandise, to Shaw & Co.

Further Extracts from Sacramento Daily Union.

1855. Sept. 3, "Surprise arrived with 180 tons."

" " 5, "Queen City arrived with 327 tons, and could have had 500 more."

" " 22, "Confidence and New World arrived with 400 tons freight."

1855. Sept. 29, "We are informed that no less than 1600 tons freight left San Francisco for the interior on Saturday last."

" Oct. 1, "Martin White arrived with 125 tons."

" " 13, "Helen Hensley arrived with 220 and New World with 180 tons. Total, 400."

" " 15, "Helen Hensley arrived with 225 and New World with 175 tons. Total, 400."

" " 30, "Surprise arrived with 300 passengers and full load of freight."

" Nov. 9, "New World arrived with 240 tons of freight."

" " 15, "Sea Bird arrived with 175 tons, and upwards of 300 passengers; the New World with 160, and the Helen Hensley 200."

" " 19, "New World arrived with 400 passengers and 200 tons of freight.

" " 20, "Helen Hensley arrived with 300 passengers and 200 tons freight."

No Wonder.—The steamer New World, one of the finest boats upon the river, and commanded by skilful and able officers struck upon the "Hog's Back," on her trip up yesterday morning. On inquiring the cause of the accident, it was discovered that in addition to 305 passengers and 200 tons freight, there were no less than *twenty-four* "*dead-heads*" on board — quite sufficient to run anything "into the ground!"

These extracts are taken as published, and although they may appear to be selected, are not so; they give a fair idea of the average of the business on the river.

The following is a list of the steamers belonging to the Cal. Steam Navigation Co., and may serve to give an idea of the extent of the steamboat interest on the river:

San Francisco to Sacramento — Low Pressure Boats.—Senator, 750 tons burden; New World, 575 tons; Antelope, 425 tons; Confidence, 375 tons; Wilson G. Hunt, 375 tons; Surprise, 300 tons.

San Francisco and Stockton — Low Pressure.—Cornelia, 250 tons.

San Francisco to Sacramento or Stockton — High Pressure Boats.—Helen Hensley, 400 tons: Bragdon, 250 tons; Urilda, 200 tons; American Eagle, 200 tons.

Sacramento to Marysville and Red Bluffs—High Pressure Boats.—Sam. Soule, Belle, Cleopatra, Gem, Governor Dana.

Marysville Low Water Boats.—Pike, Orient, Marysville, Daniel Moore.

Laid up.—Kate Kearney, Express.

In addition to these, belonging to other parties are the

Side Wheel High Pressure Boats, not in use.—Eclipse, 650 tons burden; Queen City, 500 tons burden; Defender, 500 tons burden; Anna Abernethy, 200 tons burden; Wallamette, 175 tons burden; Ellen Craig.

Stern Wheel High Pressure Boats.—Enterprise, Martin White, Young America.

2

PACIFIC RAILROAD.

REPORT

OF

THEODORE D. JUDAH,

ACCREDITED AGENT PACIFIC RAILROAD CONVENTION,

UPON HIS

OPERATIONS IN THE ATLANTIC STATES.

SAN FRANCISCO:
AUGUST, 1860.

CALIFORNIA STATE LIBRARY

REPORT.

To the Executive Committee Pacific Railroad Convention:

GENTLEMEN: Appointed by you, October 11, 1859, to bear to Washington and present the memorial of your Convention to the President, heads of Department and Congress; to act as the representative of the Convention in Washington, and to bring all possible legitimate influence to bear to secure favorable Congressional action on a Pacific Railroad Bill, I have the honor to present the following report of my proceedings, trusting it may meet your approval:

It will be remembered that in their consideration of the subject, the Convention concurred in adopting three resolutions which seemed to embody all the general principles necessary for a plan to carry out the work, to wit:

That the General Government should guarantee, under such restrictions and safeguards as might be necessary to prevent fraud, five per centum per annum upon the actual cost of the road to the parties constructing the same.

That Government should grant the right of way for the road across the Territories, and the party or company undertaking its construction should be left at liberty to select such route as they might deem for their interests.

That the State of California would undertake the construction of that part of the road within her limits.

The Convention also expressed a preference for what is known as the Central route, and recommended in their memorial some further details of minor importance.

Keeping in view these general principles, I proceeded to frame a bill in accordance therewith, a copy of which accompanies this report. A copy of the same was forwarded to California, and was indorsed and approved by the Convention at its second session in Sacramento.

On my passage to the East, being accompanied by Mr. Burch, our newly elected Congressman; also, General Lane, Senator from Oregon, I lost no time in endeavoring to impress upon these gentlemen the views of the Convention. Mr. Burch became thoroughly conversant with the action of the Convention, with whom the various provisions of the bill were carefully discussed. He manifested a regard and solicitude for our proceedings and future interests, which were fully evinced by his subsequent action in Washington. He agreed to

adopt our bill, present it to Congress and work for it, as the bill of the Convention emanating from and expressing the wishes and views of the people of California upon the subject. The bill was also presented to General Lane, who approved of it. Upon my arrival in New York I had the bill printed, also an explanatory circular (copies of which accompany, marked B and C), which were forwarded to California to Messrs. Gwin and Scott, and to the principal newspapers and prominent individuals particularly interested in the subject in our State and various other States.

Interviews were also had with various influential men in New York city and Boston on the subject.

December 3d I visited Washington, communicated with Messrs. Gwin, Scott and Burch on the subject, and endeavored to prevail on Mr. Gwin to substitute our bill for his, and present it to the Senate as the bill of the Convention. He examined the bill section by section, and although he considered some of its provisions objectionable, yet on the whole he approved of it; said that the ideas it contained were very similar to his own, and, if it could be passed as proposed, regarded it in some respects preferable to his own, but he had that morning introduced his own bill in the Senate. He stated that his own was the bill before the Senate at the last session; that it had been thoroughly discussed by that body; that it had been acted upon by the Committee, and embodied the amendments of various Senators; that the Senate was perfectly familiar with its provisions; and so much work had been done upon it, he thought it would be easier to pass it than the bill of the Convention, which was new, and would render prolonged discussion unavoidable. He expressed himself decidedly for it if it found favor and could be more easily passed than his own. His bill having been introduced and placed on the calendar as before stated, he suggested that Mr. Haun should introduce our bill also, and place it on the calendar, and that when the subject should come up he would work for the one which appeared to find most favor.

December 6th, Messrs. Gwin, Burch and Scott accompanied me to the President, with whom an interview was had. The nature of my business was explained, and agreeably to my instructions I presented the memorial and proceedings of the Convention to the President. He received them graciously, and expressed himself generally in favor of a Pacific Railroad.

Finding that the House would probably be occupied some time in the election of Speaker, and that no business could be transacted before that body, in the meantime I decided to make a tour through the West, and endeavor to awaken as much interest as possible in our efforts. Before the organization of Congress I accordingly visited New York, Albany, Syracuse, Buffalo, Cleveland, Columbus, Chicago and Cincinnati, being absent about one month, and arrived in Washington again January 14, 1860. Since which time I have been constantly engaged in endeavoring to further the passage of a Pacific Railroad Bill.

On consultation with Mr. Burch, at the suggestion of other members, it was decided to make some alterations in the bill, which was accordingly done. The bill was again printed, and also a circular explaining its features. I sent a copy of this bill and circular (marked D and E) to each member of Congress, and also to prominent newspapers and individuals throughout the country.

The Speaker of the House being chosen, the first business affecting our interests was the formation of Committees. I exerted myself with other friends to procure, among others, the appointment of Mr. Burch upon the Special Committee on Pacific Railroad. It soon became apparent that there was a great pressure on the Speaker for these positions. Parliamentary usage generally conceding the Chairmanship of a Special Committee to the member who first moves the Committee, or offers a bill and proposes its reference to a Committee to be appointed by the Speaker. Several attempts were made by members to this end, but the House seeming determined to act cautiously in the matter, these attempts were defeated by the bills being referred to Standing Committees, as the record of proceedings of February 15th and 16th will show. Mr. Scott introduced the Wigfall Pacific Railroad Bill, and moved its reference to a Select Committee, but it was referred to the Committee on Military Affairs. Mr. Farnsworth, Mr. Fenton and Mr. Curtis severally made similar ineffectual attempts.

February 16th, Mr. Burch introduced our bill and memorial and asked its reference to a Select Committee. Objection being made, he asked for the ayes and noes, on which the motion was lost. The matter was referred to the Committee on Post Offices and Post Roads, by which a point was gained, that Committee being friendly to our bill. Mr. Craig, of Missouri, on the Committee, agreed to procure its reference to himself, and to report it favorably. Finally, on the 5th of March, Mr. Sherman moved a Select Committee of fifteen, and that all the bills and memorials on the subject be referred to it, stating at the time that he did not desire the Chairmanship. The motion was carried.

I immediately saw the Speaker and explained to him the action of our Convention, our position and views. He assured me California and Oregon should be represented on the Committee, but could not say which of the delegates would be appointed, as the wishes of the Chairman was entitled to consideration, and would be consulted in the matter.

On the 14th March, the Speaker announced the following as the Committee, viz: Messrs. Farnsworth, Illinois; Phelps, Missouri; H. W. Davis, Maryland; Scott, California; Rice, Massachusetts; Fenton, New York; William Smith, Virginia; Taylor, Louisiana; Kellogg, Michigan; Blair, Pennsylvania; Aldrich, Minnesota; Hamilton, Texas; French, Maine; Stout, Oregon. Mr. Hindman, of Arkansas, was subsequently added to the Committee, increasing the number to sixteen.

The first meeting of the Committee was on March 15, 1860. A full copy of the proceedings of the Committee (marked "F") accompanying.

Mr. Scott having been appointed on the Committee, my future business operations with the Select Committee were of course through him. I cheerfully bear witness to his uniform interest and zeal on the subject, and can testify to his earnest endeavors to further our views and promote a general good feeling and harmony of action on the question of the Pacific Railroad.

Mr. Scott regarded the action of the Convention with respect and consideration, and was willing to work for any measure or bill which would give us a road. He immediately put me in communication with the members of the Committee, took me to see the Chairman, Mr. Curtis (with whom we had a long and satisfactory interview), and furnished me with the earliest information of the meetings of the Committee and its action. He also availed himself of every opportunity to introduce me to members friendly to the passage of the Pacific Railroad Bill.

My first business being to place the action and bill of the Convention before the Committee, and to procure its adoption, I sent each of them a copy of our proceedings and bill, and visited most of them personally, so that they might become thoroughly conversant with our action in California. I then prepared a letter (copy accompanying marked "G"), urging on the Committee their adoption of our views, which letter was presented by Mr. Scott, read in Committee and placed on file.

There being at this time many propositions and bills for a Pacific Railroad, emanating from different quarters—there being no less than four from the Pacific coast—and it being desirable that there should be some sort of unanimity of action, particularly from the Pacific coast, a meeting of the delegation (to which I was invited) was had, including Messrs. Latham, Gwin, Scott, Lane, Stout and Stevens, at which it was decided to drop all plans and bills until the Special Committee had matured a bill—to take that bill, no matter in what shape, work for and endeavor to pass it. It was believed at this time that the Select Committee would make an early report.

The indications being that the Committee would report a bill for one route; and afraid that if they attempted to locate that route it would result in serious trouble and perhaps defeat the bill, I endeavored, during the progress of Committee sessions, to prevail upon them, after locating termini, to leave the location of the route open, and it was pretty much decided to do so. But, inasmuch as it gave an opportunity for the Albuquerque or thirty-fifth parallel route to compete, the friends of both the Southern and Central route *via* Salt Lake united against it. This route was ably advocated by Hon. Mr. Phelps, of Missouri. The bill, as decided upon by Committee, fixed its western terminus on the navigable waters of the Sacramento river, or Bay of San Francisco, and did not contemplate its extension to the city of

San Francisco. This gave to the Central route an apparent advantage of 150 to 200 miles in length, as its length would be calculated only to Red Bluffs or vicinity. Mr. Phelps deemed this unfair, and argued that inasmuch as the corporators or trustees had been named generally from States known to be favorable to the Central or Salt Lake route; that inasmuch as the eastern termini had been decided upon to be two points severally on the western borders of Iowa and Missouri, the lines from which, uniting in two hundred miles, and thence proceeding by a main trunk westward, and as this was almost equivalent to fixing it upon the Central route, he insisted that the words "or city of San Francisco" be inserted, so as to establish something like an equality at the western end. He stated that he was willing that the friends of the Central route should name the corporators and fix the eastern termini, and he would be perfectly satisfied to take his chances, even against all these advantages, of showing his to be the nearest, best and cheapest route to the city of San Francisco, and finally succeeded in having San Francisco inserted by a vote of six to four. This controversy exciting some partisan feeling as to routes, at a subsequent meeting a motion to insert the words "*via* Salt Lake or vicinity" was, after much discussion, adopted by a vote of eight to six. Mr. Phelps then moved to further amend by adding the words "or to the mouth of the Columbia river." Mr. Stout moved to amend the amendment by inserting "to Vancouver in Washington Territory, or to Portland, Oregon." Mr. Stout's amendment to the amendment was adopted by a vote of ten to two.

The question then recurring upon Mr. Phelps' proposition, it was lost by a vote of five to nine.

I regarded this action as unfortunate, as it gave the bill a sectional aspect; it displeased the extreme North and evoked the opposition of the friends of both the thirty-fifth and thirty-second parallel. On consultation with Mr. Curtis, he became satisfied that the interests of the Central route were sufficiently protected by the eastern termini and corporators, and did not feel disposed to press the matter.

In order to obviate this difficulty—and Mr. Gwin stating that he could pass the Curtis bill in the Senate, if restored as it originally stood, leaving the route open—a new bill (copy of which accompanying is marked "G") was framed, substantially the same with that of Mr. Curtis, but leaving the route open and reducing the amount of Government aid to $50,000,000. Dr. Gwin agreed to procure its introduction in the Senate, to endeavor to call it up immediately and pass it, giving it preference over all other bills in the Senate, his own included.

Hon. Mr. Kennedy, of Maryland, took charge of and introduced it, and it was the general opinion that it would pass the Senate in that shape.

Mr. Curtis, after examining the bill, told me it would be quite satisfactory to him if the Senate would pass it in that shape.

Unfortunately for us, an opportunity to call up the subject in the Senate had not occurred when I left Washington. The cessation of business during the Charleston Convention, the debate upon the slavery question, and other matters of little moment to us, left no time for the consideration of the Pacific Railroad Bill, although it was the first bill introduced in Congress this session, and stands No. 1 on the calendar.

The House Committee having finished their labors, the Chairman was authorized to present the bill and report, but meantime Mr. Curtis had become convinced that it was best to strike out the words "Salt Lake," and by mistake, in printing the bill and report, the printer left out these words, and it was generally supposed that this was the intention of the Committee; but at a final meeting of the Committee, the morning of its consideration by the House, Mr. French, of Maine, called attention to it, and denounced it as a mutilation, declaring his intention to oppose the bill and everything connected with it unless it was restored. The mistake of the printer having placed Mr. Curtis in an embarrassing position, there being no time for discussion again, the words were restored by a vote of seven to six.

I saw Mr. French an hour afterward in the House. Had a long conversation with him on the subject, and he told me that now as it was restored he really cared very little about it; he opposed it simply because it did not truly represent the action of the Committee; it was incorrect, and no one had a right to present the bill except as it left the Committee; not if every member had informally acquiesced; it should be done officially. These were the motives which induced his course in this regard.

Accompanying (marked "E") will be found a record of the debates in the House on this subject.

Considerable difficulty was experienced in procuring an opportunity to report to the House, as some of the members carried their opposition so far as to seek occasion to interpose objections, declaring publicly their intention to resist not only its passage, but to prevent its consideration by all means within their power.

Under the rules of the House a single objection carries a bill, resolution or report over to the following day, when another objection may be made, and so on from day to day, thereby preventing its consideration. This may occur on any day but Monday, which is called suspension day, when (a member objecting) a suspension of the rules may be called for, which, if sustained by a two-thirds vote, allows a consideration of the subject.

After the Committee had matured their bill, Mr. Curtis made several ineffectual attempts to report, but the intervening Conventions and vigilance of those opposed prevented until Monday, May 13th, when under a suspension of the rules he obtained leave to report, and the bill was made a special order for Thursday, May 24th, at which time it came up for consideration, and was discussed. Friday being private

bill day, it was postponed until Monday and made the special order for Monday and Tuesday, 28th and 29th, and Mr. Curtis gave notice that he would call the previous question on Tuesday afternoon at four P. M.

It might not be inappropriate to present here a history of the debate, showing the progress made in settling upon details; but as the debates speak for themselves, are published and matters of record, I refer to the accompanying record of the proceedings of the House for the 24th, 28th and 29th of May, when it will be seen that the bill was recommitted, with a view of reconciling in Committee the differences which were embarrassing and delaying it in the House.

Those members who were unable to obtain a vote sustaining their amendments to the bill, knowing that a recommittal opened it again to amendment in the Committee, made a vigorous effort to prevent the previous question being called at the time fixed upon by the Chairman and tacitly agreed to by the House. As usual in such cases these members were disposed to magnify the difficulties and dangers surrounding its passage.

Many opposed to the passage of the bill encouraged lengthy discussion on its details, and themselves consumed a large share of the valuable time allotted to its consideration, with apparently no further object than to consume time—so that, on the arrival of the hour for the previous question, the bill would be found but imperfectly considered. As a natural consequence, when the time arrived, Mr. Curtis' call was met with the objection that by far the largest portion of the bill had not been discussed—that it might be faulty, and ought not to to be so hastily pressed to a vote. Mr. Curtis then endeavored ineffectually to have the time for consideration extended. An attack was then made upon some of its provisions by H. Winter Davis, a member of the Committee, and Mr. Millson, of Virginia—raising grave doubts in the minds of many members as to an important section—and a motion to recommit was made. This was opposed by Mr. Curtis and several of the friends of the bill, and Mr. Sherman warned the friends of the bill that, if they allowed it to be recommitted, the pressure of important business would prevent its being again reported, and would carry it over to the next session. The hour having arrived for final determination of this great question, which had agitated the public mind so many years, involving the appropriation of so large an amount of money, with all its various and important results and responsibilities staring them in the face, the objections urged by Messrs. Davis and Millson had peculiar force and weight in the minds of many members really friendly to the bill, and it was evident that a strong feeling had been aroused favorable to its recommitment, which being pressed, Mr. Curtis endeavored to procure the motion accompanied with instructions and leave to report on a specified day. In the general excitement and confusion this was misunderstood by many friends of the bill as a yielding of consent on the part of the Chairman to its recommitment. They therefore voted aye, and it was recommitted by a vote of 101 to 87.

Those opposed to the bill manifested great satisfaction at their success, considering it as defeated for the session. Its friends, although some discouraged, were not disheartened, and determined to have it before the House again.

I saw Mr. Curtis immediately after the disposal of the bill, and he decided to call the Committee together again the following day. Mr. Burch saw Mr. Davis, who stated that he was not an opponent of the Pacific Railroad, but would sit down with Mr. Curtis and try to harmonize their views. Mr. Burch and myself had an interview with Mr. Curtis that evening, and he expressed a willingness to meet the gentleman whose views differed on the provisions of the bill and to so reconcile the objections so as to be able to present the bill again, when it would be likely to pass without further delay. We also saw other gentlemen who had proposed amendments, and who agreed to help to get it before the House again.

At the following meeting of the Committee, an amendment offered by Mr. Fenton, obviating the objection of Mr. Davis, was adopted, and the opposition of the friends of a Southern route was reconciled by the insertion of a Southern route, which rendered the bill generally acceptable.

A motion to report the bill again with these amendments was, at a subsequent meeting, carried, and the passage of the bill was universally conceded, in case it could be again gotten before the House.

The House having dispatched most of its important business, and the desire for the passage of the bill being very general, the Committee were again given leave to report.

A record of the proceedings of Congress will show that when it came up, the Chairman asked that it be postponed until the third Tuesday in December next.

Among the views which influenced Mr. Curtis to take this course will probably be found the fact that the postponement of the bill to a fixed time in the next session, makes it a special order for that time, and it comes before the House in the same position in which it stood at the close of this session; so that the work done upon it in Committee is all saved; it will not have to go into Committee again; and I am sustained by the views of many intelligent gentlemen of experience in the opinion that, with proper exertion, there is little doubt of the passage of the bill at the short session.

Mr. Curtis approved of so arranging the details of the bill that instead of stopping at the eastern boundary of California, the road should run to the navigable waters of the Sacramento river, or the city of San Francisco, and provided that Government aid should be extended to that portion of the road within the limits of the State. That this was a judicious and wise provision is apparent when we consider that in order to construct the road within the time contemplated in the bill, it is absolutely necessary that its western terminus should be located on navigable waters, as the supplies of iron and material must be carried out from each end. The work of construction must be

prosecuted *pari passu* from either termini, or the work performed in the interior cannot otherwise receive its iron and material.

The amount of aid decided upon by Mr. Curtis for that portion of the road within the limits of the State was $12,000 per mile eastwardly to the base of the Sierra Nevada Mountains, and $24,000 per mile from the base of the mountains eastwardly, with an addition of $3,000 per mile for each degree of longitude, until the 109th degree was reached. I endeavored to prevail upon Mr. Curtis to increase this to $18,000 per mile, in view of the increased cost of roads in California, but could not induce him to alter it until the day it was last considered in the House, when he agreed to do so, and stated that an amendment to that effect might be offered in the House and he would accept it. The feature of the bill provides assistance for our local roads running in that direction, which assistance may possibly never be obtained in any other manner.

The bill is a very fair one. It contemplates a liberal donation or loan of United States bonds; it provides for the construction of two roads, and gives us a local road in California, which must be immediately constructed, extending from the southern line of the State through our fertile valleys, possibly to the headwaters of the Sacramento river.

It will be observed that the amount of land donated to the road is small, the reason for which is found in the fact that the Republican party have adopted the policy indicated in the Homestead Bill, and are generally opposed to the granting of lands in large bodies to any company for any purpose whatever. The amount of land originally intended to be taken was greater; but upon consultation with them it was found that a liberal donation of lands would constitute a serious impediment to the passage of the bill. They were willing, however, that in lieu thereof an increased amount of Government Bonds should be given, and aid of this kind was considered more desirable than a larger donation of lands. The bill was therefore framed to accord with their views in this respect, taking only a quantity of land sufficient for the uses of the company.

Conceiving that it lay within the sphere of my legitimate duties, and having spent my time during most of three previous sessions of Congress in endeavoring to procure the passage of a bill making grants of land to the State of California to aid in the construction of railroads therein, I prepared early in the session a bill making a grant of lands to the State of California for this purpose, but not without misgivings on the subject in view of the declared policy of the Republican party at this session, in opposition to making grants of land to any but actual settlers; but on conversation with many members of that party, I found them well disposed—that a favorable feeling towards California existed among them, and that many members would vote for such a bill for California, who would, perhaps, vote differently on a similar bill for another State, upon the grounds that, although in opposition to their policy, it would be unjust to refuse to California the same aid for

her internal improvements which had been freely granted to so many Southern and Western States. Thus encouraged, and looking for assistance to the votes of those States which had been similarly benefited, a bill (marked "I" accompanying) was prepared, introduced and referred to the Committee on Public Lands.

The bill, as originally framed, contemplated a road from the northern to the southern boundary of the State, with two branches, leading easterly to the eastern boundary, and a branch leading westerly to San Francisco, and asking ten sections of land per mile. The bill was referred in Committee to Hon. Mr. Barrett, of Missouri, who agreed to take charge of and report it favorably. Owing to delays in procuring information from the Land Department, and other causes, the bill made no progress in Committee. Mr. Barrett's time was also taken up in attending to his contested election case as to leave very little time to attend to other matters. The bill was therefore transferred to the charge of Hon. John G. Davis, of Indiana, who was friendly to and proposed to report it favorably. At Mr. Davis' request, I computed the quantity of lands and number of miles of road, which, when footed up, appeared so large that it was thought best to reduce both the length and number of sections per mile. Accordingly a new bill was drawn up for a substitute, contemplating a system of valley roads extending from the head of Tulare Valley on the south, to Shasta on the north, to San Francisco and Benicia or Vallejo on the west, and to the eastern boundary of the State on the east. The quantity of land was also reduced to seven sections, or 4,480 acres per mile, or about 3,500,000 acres in all; and it was further provided that where, by reason of the occurrence of Spanish or Mexican grants, or mineral lands, or lands condemned by the United States Surveyor as worthless, the full amount contemplated by the bill could not be had within certain limits, the balance of the quota might be selected from any of the Government lands (not mineral lands) within the limits of the State, such selection to be made by agent or agents to be appointed by the Governor, and selections to be approved by the Secretary of the Interior.

Mr. Davis had also charge of similar bills for the Territories of Kansas and Nebraska, which were first acted upon by the Committee, reported to the House, put on their passage and lost.

Mr. Davis, feeling somewhat chagrined at the fate of the bills, requested to be relieved of the charge of ours, which was again transferred to the charge of Hon. Eli Thayer, of Massachusetts, Chairman of the Committee on Public Lands, who expressed himself in favor of the bill and manifested an interest in our movements. The business had so accumulated on the hands of the Committee that it was sometime before our bill came before them for action. They finally took it up, passed it in Committee unanimously and authorized the Chairman to report it favorably to the House. We urged on Mr. Thayer the necessity of making an early report to the House, to which he assented, but said that it was the intention of the Committee to ask of the House

one or two days to be set apart for the consideration of business of that Committee, when all their business would be disposed of.

The Charleston Convention intervening, no business was transacted for ten days, and Mr. Thayer being a delegate to the Chicago Convention, nothing was done with it until his return, except to prepare a copy of the bill which was introduced in the Senate by Mr. Latham and referred to the Committee on Public Lands. General Lane, on that Committee, consented to look after it there.

On Mr. Thayer's return, the public business of importance had so accumulated in the House that he was unable to procure a time to be set for the consideration of the business of his Committee, and it was doubtful even if it would be called before the close of the session.

There is a generally favorable feeling towards this bill in the House, and could it have been gotten up it would undoubtedly have passed.

Mr. Burch has exerted himself with commendable zeal, and did everything in his power to induce it to be reported to the House.

In case this bill passes, I would state that the lines of railroad, as called for in the bill, are laid down on a map I prepared for the Committee on Public Lands, who required the indorsement or approval of the delegation, who gave such approval. The map, therefore, becomes valuable as indicating the position of the lines to which the aid granted in the bill was contemplated to be given. This map will be preserved for future reference.

I have also devoted a portion of my time and attention to the bill providing for a survey of the eastern boundary of California, which, having passed and received the approval of the President, leaves nothing more to be said about it. A copy of that bill is appended, also a copy of my communication to the delegation with regard to the difficulties and cost of making such survey.

I have also collected some reliable information with regard to the operating of locomotive engines on heavy grades, which becomes highly important in view of solving the question of crossing the Sierra Nevada mountains, as it establishes the fact that grades of as high as three hundred and fifty feet per mile can be overcome and operated with perfect safety.

I think it just and proper to state that, through the kindness and personal exertion of Hon. J. C. Burch, a room was provided in the Capitol (the old Vice President's room), easy of access, upon the same floor with the hall of the House and Senate, which was appropriately furnished and given me for my uses and purposes. This was considered a general headquarters for the Pacific Railroad. I procured all the maps, reports, surveys, and papers of every kind, to be found on the subject, and, it being so convenient to the Halls, many of the Senators and members were accustomed to drop in almost daily. You may be assured that no opportunity was lost to further our views and impress on them the importance in which the subject is held in California

I conceive the occasion a proper one to express my obligations to our Congressional delegation for the uniform kindness they have extended to me and the interest they have manifested throughout. Also to Lieutenant Abbott, of the Engineer Corps, U. S. A., in charge of Pacific Railroad surveys, for his kindness in furnishing me with copies of the maps, profiles, etc., in his charge. Also to Messrs. Curtis, Phelps, Stevens, Stout, Otero, French, Logan, Elihu B. Washburne, Thayer, Lice and Grow, members of the House.

It gives me pleasure to be able to present the accompanying testimonial, signed by the entire delegation from California, also by Messrs. Lane, Curtis, Phelps and E. B. Washburne, approving my course in Washington.

I would also state that, although the expenses of my mission, apart from my time, have cost me over $2,500, the only bills I have to present are:

For printing bill and circular in New York	$20
For printing bill and circular in Washington	20
Total	$40

Accompanying this report will be found the following papers, copies of which are at the service of the Executive Committee: A—Debate in House on Pacific Railroad Bill; B—Bill printed in New York; C—Printed Circular accompanying; D—Bill printed in Washington; E—Circular accompanying; F—Full Official Report of Proceedings of Pacific Railroad Committee at each meeting (valuable); G—Communication of T. D. Judah to Pacific Railroad Committee; H—Letter of Approval of Delegation; I—Circular of Railroad Convention held at Louisville March 21, 1860; J—Memorial of Edward Larned to Congress, on Pacific Railroad; K—Letter of H. D. Whitcomb, Chief Engineer Virginia Central Railroad; L—Letter of Thomas Dodarnead, Superintendent Virginia Central Railroad; M—Letter of M. W. Baldwin & Co., locomotive builders, Philadelphia; N—Pamphlet by Charles Ellett, Esq.; O—Three Speeches of Hon. Wm. M. Gwin on Pacific Railroad; P—Original Bill of Hon. Mr. Curtis; Q—Bill of Select Committee; R—Bill introduced by Hon. Mr. Kennedy, United States Senate; S—Bill of Convention, introduced by Hon. Messrs. Haun and Burch; T—Report of Select Committee; U—Bill introduced by Hon. Messrs. Wigfall and Scott; V—Argument and Bill of F. W. Lander, Esq.; W—Bill introduced by Hon. Mr. Stout; X—Bill introduced by Hon. Mr. Boteler; Y—Communication to delegation respecting Survey of Eastern Boundary; Z—Copy of Map furnished Committee on Public Lands.

All of which is respectfully submitted.

Very respectfully,

THEODORE D. JUDAH.

Baldwin

CENTRAL PACIFIC

RAILROAD COMPANY

OF

CALIFORNIA.

By

Theodore D. Judah

NOVEMBER 1, 1860.

SAN FRANCISCO:
TOWNE & BACON, PRINTERS, EXCELSIOR BOOK AND JOB OFFICE,
125 Clay Street, South-West corner of Sansome.
1860.

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Central Pacific Railroad of California.

Sacramento, Nov. 1st, 1860.

The object of this communication is to direct attention to some newly discovered facts with reference to the route of the Pacific Railroad through the State of California.

Confident of the existence of a practicable line across the Sierra Nevada mountains, nearer and more direct than the proposed line via Madelin Pass and head waters of the Sacramento, I have devoted the past few months to an exploration of several routes and passes through Central California, resulting in the discovery of a practicable route from the city of Sacramento, upon the divide between Bear river and the North Fork of the American, *via* Illinoistown, Dutch Flat, and Summit Valley to the Truckee river; which gives nearly a direct line to Washoe, with maximum grades of one hundred feet per mile

The distance from Sacramento to Summit is one hundred and two miles; to the State line, about one hundred and fifteen miles; to Truckee City, one hundred and forty-six miles; and to Virginia City, one hundred and sixty-two miles. The elevation of the Pass is 6,690 feet.

The importance of this information is apparent, when we consider this line effects a saving in distance, over the northern line, of one hundred and fifty miles, and avoids the passage of two cañons on the Sacramento river, twenty-miles long, estimated by Lieut. Beckwith to cost $4,200,000; while it affords a direct line to Washoe, across the narrowest portion of the State, and a local road for the business of Sacramento, Placer, and Nevada counties.

The Pacific Railroad Bill, as matured by the last Congress, and which is made the special order for the third Tuesday in December next, provides the following appropriations for the construction of the road through California, viz: $18,000 per mile from the navigable waters of the Sacramento river to the base of the Sierra Nevada; thence $24,000 per mile to the Summit; thence an additional $3,000 per mile for each degree of longitude crossed, until the one hundred and ninth degree is reached.

Inasmuch as the road through the State of California must be constructed by an organization effected under the laws of the State, it is proposed to organize a company, for the purpose of constructing a road through the State upon this route, in anticipation of the passage of this bill; to procure the recognition of this as the line of the Pacific Railroad through California; to procure the appropriations appertaining to this end of the route; and to construct the road under this organization.

This will be effected by inserting the name of this company directly in the bill, as the company to whom these appropriations shall come, or by an arrangement with the corporators or trustees named in the bill.

In organizing a Railroad Company in this State, the law requires that $1,000 per mile shall be subscribed, and ten per cent. paid in. The estimated length of the road to the

State line is one hundred and fifteen miles, requiring a subscription of $115,000, on which ten per cent., or $11,500, is required to be paid in. It is proposed to make with this ten per cent., a thorough, practical Railroad survey, establishing the grades, cuttings, and fillings, and to make the necessary maps, profiles, estimates, reports, etc.

To the accomplishment of this end, the instrument required by law has been drawn up, and has, in the towns of Dutch Flat, Illinoistown, Grass Valley, and Nevada, received a bona fida subscription of $46,500, leaving about $70,000 subscription (requiring a payment of $7,000) to be made up in the cities of San Francisco and Sacramento. It is not considered necessary to make an urgent appeal for subscriptions, but simply to present a plain statement of the facts to a few persons of responsibility and influence in those cities, who feel an interest in the matter, who will subscribe in good faith, and who are able to pay in the ten per cent. without embarrassment. To this end your co-operation is respectfully solicited, and a subscription from yourself asked.

The plan will receive the support of our delegation in Congress; and Col. Baker carries on with him a profile of the route. It has also received the approval of Governor Downey, and many other influential and prominent gentlemen. Messrs. Burch and Scott, and Mr. Curtis, Chairman of the Pacific Railroad Committee in Congress, have been fully posted up with regard to this movement.

A bill is also before Congress, providing for an appropriation of 4,480 acres per mile of Government lands. Mr. Burch will press this bill in the next Congress.

It is intended that no further call than the ten per cent. required by law shall be made; and no further assurance of this statement seems necessary, when it is known that

the law compels the subscription of the *whole capital stock*, with ten per cent. paid in, before any additional assessment can be called.

It is estimated that the entire road can be graded for the amount of appropriation proposed to be given by Government, leaving only the iron, rolling stock, etc., to be provided for by other means. An issue of first mortgage bonds of $12,000 per mile, will furnish this material.

The road may connect either with the Sacramento Valley Road at Folsom, or with the California Central Road, at Lincoln.

The counties of Sacramento, Placer, and Nevada will probably vote to subscribe $500,000 toward its construction.

It is important that this organization be effected before the sitting of the next Congress, that they may deal with a company already in existence.

IN CASE GOVERNMENT APPROPRIATIONS ARE NOT FORTHCOMING.

In answer to the question: What can be done in case no appropriations are granted by the General Government? a brief programme is herein presented, which is well worth attentive consideration.

ADOPT GRADES OF TWO HUNDRED AND FIFTY FEET PER MILE.

The experience of the past six years has demonstrated that grades of as high as three hundred and fifty feet per mile can be advantageously employed, and successfully worked with modern locomotive engines.

EXPERIENCE OF THE VIRGINIA CENTRAL RAILROAD.

The Virginia Central Railroad has, from 1854 until a

short time since, crossed the Alleghany mountains, and performed their regular business over grades of three hundred feet per mile, and curves as high as two hundred and thirty-eight feet radius.

Mr. Ellett, the engineer of that road, in a published statement, appearing in 1856, says: "This road was opened to the public in the spring of 1854, and has now, in the autumn of 1856, been in constant use for a period of more than two and a half years. In all this time, the admirable engines relied on to perform the extraordinary duties imposed upon them in the passage of this summit, have failed *but once* to make their regular trips. The mountain has been covered with deep snows for weeks in succession, and the cuts have been frequently filled, for long periods, many feet in depth with drifted snow; the ground has been covered with sleet and ice, and every impediment due to bad weather and inclement seasons, has been encountered, and successfully surmounted in working this track.

SUCCESSFUL OPERATIONS DURING SEVERE STORMS.

"During the last severe winter, when the travel upon all the railways of Virginia and the Northern and Western States was interrupted, and on many lines for days in succession, the engines upon this mountain track, with the exception of the single day already specified, moved regularly forward, and did their appointed work.

"In fact, during the space of two and a half years that the road has been in use, they have only failed to take the mail through in this single instance, when the train was caught in a snow-drift near the summit of the mountain.

REGULAR DAILY SERVICE OF ENGINES—PASSENGER TRAINS.

"The regular daily service of each of the engines is, to

make four trips of eight miles, over the mountain, drawing one eight-wheeled baggage car, together with two eight-wheeled passenger cars, in each direction.

DAILY SERVICE OF FREIGHT TRAINS.

"In conveying freight, the regular train on the mountain is three eight-wheel house-cars, fully loaded, or four partly loaded. Sometimes when the business is heavy, loads have exceeded fifty tons.

ABILITY TO STOP AND START ON THESE GRADES.

"With such trains, the engines are stopped on the track, ascending or descending, and started again, on the steepest grades, at the discretion of the engineer. The ascending engines stop daily on a grade of two hundred and eighty feet per mile, and are there held by the brakes while the tank is being filled, and started again at the signal, without any difficulty.

SPEED OF ENGINES.

"The ordinary speed of the engines, when loaded, is seven and a half miles an hour, on the ascending grades.

"Greater speed and larger loads might, doubtless, be permitted, with success; but the policy has been to work the track with perfect safety, to risk nothing, and to obtain and hold the public confidence.

CONSUMPTION OF FUEL.

"The ordinary consumption of fuel in ascending to the summit, or to an elevation of six hundred and sixty feet, over many curves of three hundred feet radius, is forty-

two cubic feet, or nearly one-third of a cord. For traversing the whole distance, eight miles, including both the ascent and descent, two thirds of a cord, or one dollar and thirty-three cents.

COST OF OPERATING MOUNTAIN TRACKS.

"The total cost of working the two engines, when making two round trips per diem of thirty-two miles each, or a total of sixty-four miles per diem, is $830 per month, or an annual locomotive expense of $9,960.

"The cost of maintenance, repairs of road, night-watch, &c., is $4,795 per year, or a total annual expense of $14,755.

WEIGHT AND COST OF ENGINES.

"The engines weigh twenty-seven and a half tons, fully loaded, with wood and water, and cost $12,500 each."

Thus the entire practicability of a mountain road, over grades of three hundred feet per mile, and curve of three hundred to two hundred and thirty-eight feet radius, is successfully proven by actual experience. Let us draw some conclusions therefrom.

PROPOSED PLAN OF ACCOMPLISHMENT.

Even should the General Government make the proposed appropriations, and were the capital all subscribed and paid in, ready to commence work, the requirements of the bill, no less than the necessity for an economical and rapid construction of the road, would seem to point to this as the best plan upon which to undertake the work. The grading of a permanent track upon this route would occupy not less than two, and perhaps two and a half years.

REASONS FOR ADOPTING THIS PLAN.

As the road must be built from the two ends, in order to procure iron, ties, &c., with which to lay the track, no grading beyond could be done, or if done, could not be used, until this division through the State was completed, thereby delaying the whole work for a corresponding period.

TIME NECESSARY TO COMPLETE.

A road can be built npon the plan proposed, in twelve months from the time of breaking ground.

DISTANCE AND ELEVATION TO OVERCOME.

The distance from the line of the present roads, now constructed, to the summit, is sixty-eight (called seventy) miles; the elevation to be overcome, say, 6,200 feet; being an average grade of ninety feet per mile.

Let the line be permanently located, as it will run finally, at one hundred feet grades.

PORTIONS OF LINE WHICH WILL ANSWER.

There are many miles of this line where the grading of the permanent line will be *comparatively* light, and not expensive. The balance will consist of heavy work—deep cuts and high embankments.

HOW GRADING SHOULD BE DONE.

Let the line be graded permanently wherever the grading is light and inexpensive; and wherever a heavy cut or succession of heavy work presents itself, it is proposed to use grades of as high as two hundred and fifty feet per mile, and run around or over them, forming a connected line,

which can be built ready for use in twelve months; using the same to run out iron and ties for the work beyond, and for the transaction of the present Washoe, Carson Valley, and Salt Lake business.

IRON AND TIES TO BE PERMANENT.

Let the iron and ties procured be such as will be used on the permanent road. Meantime, should these appropriations be procured from Government, the work of grading for permanent road can be carried on, and as far as finished, the track moved over on to it.

IRON, ETC., CAN BE PROCURED.

If the work of grading, procuring ties, and laying track can be done by parties here, no difficulty will be experienced in finding parties in the East who will furnish the iron and equipment with which to lay the track, upon the most favorable terms.

COST OF GRADING, TIES, ETC.

The construction of the present roads in California has given rise to erroneous impressions as to the actual cost of railroads in this State.

COUNTY AID PROPOSED.

It is proposed to do the grading, ties, and track-laying of this road by County and State aid, in the following manner:

Nevada County, - - - -	$300.000
Placer County, - - - -	250.000
Sacramento County, - - -	150.000

It is proposed to ask the Legislature, at its coming session, to grant a bonus of $250,000 to the company who shall first build a railroad to the State line, over which a single engine will haul a load of sixty tons of freight.

COUNTIES NOT TO BECOME STOCKHOLDERS.

It is not proposed that the Counties become stockholders, but issue their bonds, receiving in exchange therefor, an equal amount of the bonds of the railroad company.

NEVADA COUNTY.

It is proposed that Nevada County allows $150,000 to be expended on the main line; the remaining $150,000 to be expended on a road in that county, to connect therewith.

PLACER COUNTY.

It is proposed that Placer County allow $200,000 to be expended on the main line, and $50,000 toward other roads within her limits.

SACRAMENTO COUNTY.

That Sacramento County allow the $150,000 to be expended on the main line.

STATE BONDS.

That the State pay over the $250,000 whenever an engine runs through to the State line.

PARTIES WILL CONSTRUCT THE ROAD WITH THIS AID.

With this aid, responsible parties will enter into contract to construct, and place such a road in running order, in

twelve months from date of breaking ground—six months being allowed in which to make surveys and necessary preparations.

PROPOSED INCREASE OF TARIFF.

It is also proposed to ask the Legislature, in view of the increased cost of operating a line across the Sierra Nevada, to authorize this company to charge for *through* passengers and freight: fifteen cents per passenger per mile, and thirty cents per ton of freight per mile; which is only about one-sixth the lowest rates at which freight is now carried to Washoe.

Way passengers and freight, or local business to and from these counties, at the usual rates.

BUSINESS OF THIS ROAD.

The business that such a road will perform will necessarily be large; the present business transacted by teams must be seen to be appreciated. It is not unusual to meet or pass three hundred loaded teams, *en route* for Washoe, in a day, loaded with an average of two and a half tons.

It is estimated that not less than an average of seventy-five tons per diem has passed over the roads to Washoe during the past season.

PRESENT RATES OF FREIGHT.

The lowest rates of freight, by ox teams, is six cents per pound, or $120 per ton; and when the roads are bad, double and treble these rates are paid.

This business is constantly increasing, and it is believed that the effect of the construction of this road will nearly if not fully double it.

RETURN FREIGHTS OF SILVER ORE.

But by far the most important business to be performed is the return freight of silver ore to Sacramento and San Francisco. It is well known that none but the richer ores are worked or sent away, constituting a small proportion of the ore taken out, by far the larger portion being the less valuable ores, which are thrown one side, to remain until the richer ores are exhausted, in the hope that meantime some less expensive mode of extracting the silver will be found.

COST OF FREIGHTING SILVER ORE.

Were a railroad constructed, ore could be laid down in Sacramento and San Francisco at $30 per ton. The miner of moderate means, who owns a claim, but is not able to put up a mill and work it, can send the product of his claim daily to a market at Sacramento and San Francisco. There will be no necessity for selecting and separating ores as at present, as all will be sent down and separated at the mills below.

PROFITABLENESS OF ROAD.

An estimate can scarcely be made of the profitableness of such a road, for no instance of a road with a similar business exists. It is believed that its profitableness will exceed that of any known road in the world.

For the purpose of illustrating its business capacities, we have only to compare it with coal roads in the United States of a similar class.

CAPACITY OF SIMILAR ROADS.

The Mine Hill and Schuylkill Haven Railroad possesses

grades of two hundred and fifty feet per mile. The tonnage of coal over this road, which (it is to be borne in mind) is one way, was as follows:

For 1855 - - - - -	1,534,876
For 1856 - - - - -	1,614,887
For 1857 - - - - -	1,564,119
For 1858 - - - - -	1,452,083

Or an average of about five hundred tons per day.

DESCENDING GRADES FOR RETURN FREIGHT.

It will be remembered that the up grades are principally ascending eastwardly, while the return loads are carried mostly on down grades. The capacity of this road then for return business is not to be judged by the character of its ascending grades.

APPROXIMATE ESTIMATE OF RECEIPTS.

An approximate estimate of the business of this road is here presented, supposing it sufficient to require one passenger and one freight train per day each way.

ESTIMATE.

50 tons outward freight, at $50 per ton, - -	$2,500
100 tons return freight, at $25 per ton, - -	2,500
25 passengers each way, at $25, - - - -	1,250
Total receipts per diem, - - - - -	$6,250

Which, for 313 days per year, gives as yearly receipts the gross sum of $1,956,250.

The attention of business men is respectfully invited to a consideration of the above facts.

Respectfully, &c.,

THEODORE D. JUDAH.

San Francisco, November 4, 1860.

Theodore Judah, Esq.:

Dear Sir—In reply to your letter of the 3d inst., asking for information in regard to the prospect of business of a railroad from the navigable waters of the Sacramento to the mining districts of Washoe, we have to state that, from our observation and knowledge of the resources of that section of the country, we should deem it a safe calculation to say that no railroad was ever contemplated in California with such flattering prospects of a large and lucrative business, and which promised such universal benefit to the people of the State.

To go into details would occupy more space than the limits of this hasty communication will warrant; but we think it safe to estimate that such a road will increase the amount of business now being done over the present route to the mining districts named very largely.

From careful inquiry and observation, we find that, with the present limited facilities of travel, there are not less than seventy-five persons passing over the road, to and from, daily; and during that portion of the season when the state of the roads permit of the transportation of freight, we should say at least fifty tons daily—increased facilities would of course increase both the travel and the quantity of freight going forward.

There are now probably forty to fifty mining claims being worked, from which not less than two hundred tons of ore are being taken out daily, that would warrant shipment at a low rate of freight. There are four first class

mines, viz, the Ophir, Mexican, Central and Gould & Curry, that alone are capable of turning out that quantity of ore, of sufficient value to warrant transportation by railroad to this place for shipment.

It is only necessary to furnish facilities for cheap transportation, to insure the opening and working of hundreds of rich claims, capable of turning out an almost incredible quantity of ore, every ton of which would meet with ready sale on its delivery at either terminus of the road. It is a safe calculation to estimate that five hundred tons of ore daily would be sent over such a road, at a rate of freight not exceeding say $25 per ton. In fact, the only limit to the quantity would perhaps be the inability of the road to do the business offered.

There are at the present time a number of agencies of eastern and foreign capital, armed with authority and means to purchase, at remunerative prices to the producer, ores of any grade, from $100 per ton and upward; but, owing to the limited quantity arriving, have not been able to purchase a fraction of the orders in hand. It is difficult to say what would be the limit to the amount of capital seeking investment in this channel. It is safe to say that five thousand tons of ore could be sold for cash at this moment, if it could be had.

In regard to the benefit to the State and cities of California, that would arise from the enterprise proposed by you, it is almost impossible to calculate its extent. That it would make it the richest and most prosperous State in the Union there is not a doubt. This new resource of wealth is unbounded, and the only obstacle to its realization is that which your project will most certainly remove.

A railroad such as you propose to build would, in our humble opinion, develope at once the resources of the

mineral wealth of that section of country, of which but little is yet known, and but the tithe has been told.

Very respectfully,
Your obedient servants,
OGDEN & WILSON.

Central Pacific railroad company of California, Nov. 1, 1860

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SACRAMENTO, NOVEMBER 10, 1860.

DEAR SIR:

The object of this communication is to direct attention to some newly discovered facts with reference to the route of the Pacific Railroad through the State of California.

Confident of the existence of a practicable line across the Sierra Nevada mountains, nearer and more direct than the proposed line via Madelin Pass and head waters of the Sacramento, I have devoted the past few months to an exploration of several routes and passes through Central California, resulting in the discovery of a practicable route from the city of Sacramento upon the divide between Bear river and North Fork of the American, via Illinoistown and Dutch Flat, through Lake Pass on the Truckee river, which gives nearly a direct line to Washoe, with maximum grades of one hundred feet per mile.

The distance from Sacramento to Summit is 102 miles; to State line about 115 miles; to Virginia City 162 miles. The elevation of Pass is 6,690 feet.

The importance of this information is apparent, when we consider this line effects a saving in distance over the northern line of 150 miles, and avoids the passage of two cañons on the Sacramento river twenty-one miles long, estimated by Lieut. Beckwith to cost $4,200,000, while it affords a direct line to Washoe across the narrowest portion of the State, and a local road for the business of Sacramento, Placer and Nevada counties.

The Pacific Railroad bill, as matured by last Congress, and which is made the special order for the third Tuesday in December next, provides the following appropriations for construction of the road through California, viz: $18,000 per mile from navigable waters of the Sacramento river to the base the Sierra Nevada; thence $24,000 per mile to the Summit; thence an additional $3,000 per mile for each degree of longitude crossed until the 109th degree is reached.

Inasmuch as the road through the State of California must be constructed by an organization effected under the laws of the State, it is proposed to immediately organize a company for the purpose of constructing the road through the State upon this route in anticipation of the passage of this bill; to procure the recognition of this as the line of the Pacific Railroad through California; to procure the appropriations appertaining to this end of the route, and to construct the road under this organization.

This will be effected by either inserting the name of this company directly in the bill as the company to whom these appropriations shall come, or by an arrangement with the corporators or trustees named in the bill.

In organizing a Railroad Company in this State, the law requires that $1,000 per mile shall be subscribed and ten per cent. paid in. The estimated length of road to the State line is 115 miles, requiring a subscription of $115,000, on which ten per cent., or $11,500, is required to be paid in. It is proposed to make with this ten per cent., a thorough, practical Railroad survey, establishing the grades, cuttings, fillings, and to make the necessary maps, profiles, estimates, reports, etc.

To the accomplishment of this end, the instrument required by law has been drawn up, and has, in the towns of Dutch Flat, Illinoistown, Grass Valley and Nevada, received a bona fide subscription of $46,500, leaving about $70,000 subscription (requiring a payment of $7,000) to be made up in the cities of San Francisco and Sacramento. It is not considered necessary to make an urgent appeal for subscriptions, but to simply present a plain statement of the facts to a few persons of responsibility and influence in those cities who feel an interest in the matter, who will subscribe in good faith, and who are able to pay in the ten per cent. without embarrassment. To this end your co-operation is respectfully solicited and a subscription from yourself asked.

The plan will receive the support of our delegation in Congress, and Col. Baker carries on with him a profile of the route. It has also received the approval of Gov. Downey and many other influential and prominent gentlemen. Messrs. Burch and Scott, and Mr. Curtis, Chairman of the Pacific Railroad Committee in Congress, have been fully posted up with regard to this movement.

It is intended that no further call than the ten per cent. required by law shall be made; and no further assurance of this statement seems necessary when it is known that the law compels the subscription of the *whole capital stock*, with ten per cent. paid in, before any additional assessment can be called.

I estimate that the entire road can be graded for the amount of appropriation proposed to be given by Government, leaving only the iron, rolling stock, etc., to be provided for by other means. An issue of first mortgage bonds of $12,000 per mile will furnish this material.

A bill is also before Congress providing for an appropriation of 4,480 acres per mile of Government lands. Mr. Burch will press this bill in the next Congress.

The road may connect either with the Sacramento Valley Road at Folsom, or with the California Central Road at Lincoln.

The counties of Placer and Nevada will probably vote to subscribe $500,000 toward the construction of the lower portion of the road.

It is important that this organization be effected before the sitting of next Congress, that they may deal with a company already in existence.

Very respectfully,

THEODORE D. JUDAH.

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CALIFORNIA STATE LIBRARY

REPORT

OF THE

CHIEF ENGINEER

OF THE

Central Pacific Railroad

COMPANY OF CALIFORNIA,

ON HIS

OPERATIONS IN THE ATLANTIC STATES.

SACRAMENTO:
H. S. CROCKER & CO.'S PRINT, 107 J STREET.
1862.

CALIFORNIA STATE LIBRARY

REPORT.

SACRAMENTO, September 1, 1862.

To the President and Directors of the Central Pacific Railroad Company of California:

GENTLEMEN—In compliance with a resolution of the Board of Directors, a copy of which, marked A, is herewith appended, passed October 9, 1861, appointing me as accredited Agent and Chief Engineer, with instructions to proceed to Washington to further the interests of this company there, in obtaining Congressional grants, appropriations, etc.

I collected together all the maps, profiles, field notes, etc., of our recent survey, and sailed for the Atlantic States on steamer of October 10, 1861.

Our Congressional Representative, Mr. Sargent, being a fellow-passenger, a good opportunity was afforded for explaining many features of our project not easily understood, without more than a cursory examination, which explanations were of great service to us in future operations.

The trip also afforded an opportunity to write a portion of the report of our recent survey, which being subsequently completed in the City of New York, I procured one thousand copies to be printed, distributing a portion of the same among railroad men, where likely to do us most good, sending copies to President Lincoln, the heads of Departments, and to our Senators and Represen-

tatives in Congress. It was also published in the railroad journals, and thereby obtained considerable circulation before the meeting of Congress.

Meeting in New York our Senator, Hon. Jas. A. McDougall, Chairman of Senate Pacific Railroad Committee, after a long and exceedingly satisfactory interview, I left fully satisfied that in him the Pacific Railroad had a firm friend, not likely to be discouraged by the threatening aspect of our affairs, but ready and anxious to adopt the plan best calculated to make the Pacific Railroad a success in the present session of Congress, and to urge the same to speedy termination.

Mr. McDougall requested me to arrive at Washington at least a week before the meeting of Congress, to assist him in preparing a bill, so as to have it ready to introduce at an early day.

I accordingly proceeded to Washington on the 20th, and lost no time in calling upon both our Senators.

Senator McDougall saw in the present position and temper of Congress a favorable time to press the subject of Pacific Railroad, and accordingly determined to report a bill from his Committee at an early day. At his request, I prepared a bill similar in its general features to the Curtis bill, embodying improvements and ideas suggested by himself, and also incorporating some ideas suggested by others, his intention being to lose no time in introducing this bill. But upon mature reflection and consultation, it was thought advisable to await the action of the House, and try to maintain an uniformity and concert of action.

Upon Mr. Sargent's arrival in Washington, there was yet undisposed of a vacancy in Pacific Railroad Committee, and also on Indian Affairs. The Speaker assigned Mr. Sargent to the Pacific Railroad Committee, and to no other, so that what then seemed almost like an act of hardship, in assigning a new member to *no* standing committee, but placing him on a special committee which had for many years been unsuccessful in their labors, in reality proved an act of great benefit to our future interests, as well as to the State of California; for Mr. Sargent, having no other committee duties to occupy his attention, took hold of the Pacific Railroad and devoted his time and energies almost exclusively to that subject.

Mr. Sargent, in the early part of the session, prepared a bill which was introduced into the House, and referred to the Pacific

Railroad Committee of the House, but for nearly two months it seemed almost impossible to awaken any interest in the subject until the latter part of January.

Determined to arouse the attention of the House, and endeavoring to procure, if possible, some action on the subject, Congress being in Committee of the Whole on the state of the Union, Mr. Sargent obtained the floor and delivered his first speech on the subject of Pacific Railroad, instead of on the prevailing topic of the day. Being rather inappropriate to the business then before the House, it occasioned some surprise, but the arguments it contained were so well taken and so forcibly put, as to arouse attention to the subject, and thereby accomplishing the expected result.

A meeting of the House Pacific Railroad Committee was almost immediately called, at which they decided to report, favorably, a bill forthwith. Mr. Sergeant offered a resolution in committee, appointing a sub-committee to prepare a bill, which passed, the Chairman appointing Messrs. Campbell, Sargent, Franchot and Shield, on such committee. Up to this time several bills had been introduced in the House, but they, with one exception, were all framed upon the theory of the Curtis bill in regard to the construction of road at the ends, creating but one company, and giving to them the whole road from the Missouri river to the Pacific ocean. The only exception to this was a bill (afterwards known as the Rollins bill), introduced by Mr. Rollins in the House, and by Mr. Pomeroy in the Senate, giving the eastern end to a Kansas company, and the western end, in California, to our company; and strange as it may seem, although differing in that respect from any other bill ever before offered, yet the theory of this bill seemed to be regarded quite favorably. The work of preparing a bill for the sub-committee having fallen upon Mr. Sargent, upon thorough examination and consultation with the friends of the Pacific Railroad, he decided to favor the plan of the Rollins bill, as obviously the most desirable, and frame a bill giving the ends to companies as therein contemplated. The original Rollins bill was imperfect in many particulars; as for instance, it provided that for two hundred and fifty miles from the foot of Rocky Mountains westerly, and two hundred and fifty miles from the California State line eastwardly, the appropriations should be *doubled*, or $32,000 per mile; which would give an increased appropriation on our side, east of the Sierra Nevadas, *exactly where it was not wanted*.. We wanted it across the Sierra

Nevada Mountains, while this bill gave it only after they were crossed. This was altered, making the appropriation *treble* instead of double, for one hundred and fifty miles from the west base of Sierra Nevada eastwardly, and from the east base of the Rocky Mountains westwardly, while on all the intermediate intervening space, the appropriation was *doubled.* That bill also gave any other company in California the right to unite with our road, and become participants in benefits, appropriations, etc., of the bill. This clause was also removed.

The Nevada company, of Nevada Territory, not mentioned in the Rollins bill, was also recognized in the new bill, and the grants through that Territory given to that company.

Various other modifications and improvements were made, and the bill presented to sub-committee by Mr. Sargent. It received their sanction, was reported to their main committee, and received the general approval of that committee.

In the meantime Gen. McDougall had called several meetings of his committee, who had before it all the several bills introduced, and among them the Rollins bill, introduced by Mr. Pomeroy, and here, as to structure, this bill seemed to meet with most favor.

Being made aware, from day to day, of the action of the House committee, and becoming convinced of the necessity of harmony of action between Senate and House on the bill, Gen. McDougall determined to await the action of the House committees, and if they adopted a bill, which both committees could agree upon, to report the same bill to the Senate.

Immediately upon learning of the result of the action of the House sub-committee, he called his committee together, and they decided to adopt the House sub-committee's bill, which was done, and (on February 25, 1862), it was reported to the Senate for leave to print, and recommitted to the Senate Pacific Railroad Committee before being reported by the main House Pacific Railroad Committee to the House.

A few days afterward (March 4, 1862), the House committe reported this bill to the House, which was printed, and referred back to the committee.

It is not to be thought that all these matters were being accomplished without opposition; they were done in the face of decided opposition and determined hostility from various parties, whose

interests were antagonistic to our own, and who fought the bill with energy to the end.

You will observe that much had now been accomplished, notwithstanding the fact that all other bills, at all other sessions of Congress were framed upon the principle of recognizing but one company to build the entire road, which principle seemed to have been settled upon by general consent, as evidenced by the discussions and vote upon the Curtis bill in the two previous sessions of Congress. Yet this was a bill recognizing the employment of companies already existing at either end, and making the appropriations direct to them for the construction of the road through their respective States, one of them being our own company. The Maine, or Perham Company, who have had bills before Congress at every session for the last six years, and who had their bill before both branches of Congress at this session of Congress, were entirely ignored, though appropriations increased throughout the whole bill, and *double* the amounts contemplated in the Curtis bill, given to us, through the State of California to the Big Bend of Truckee. The right given us to build the *entire line* in California, either from the Sacramento river or from San Francisco; the Nevada company recognized, and $32,000 per mile, with 6,400 acres of land per mile given for that portion of the road; the lengths of sections across the Sierra Nevadas reduced from forty to twenty miles; two years given us in which to build the first fifty miles, and only fifty miles per year required thereafter. And this bill approved and reported by both House and Senate committees at the same time—this was the first time that both Pacific Railroad Committees of Congress ever reported in unison the same bill, and at the time this was done, the Chairmen of the two committees had not met, or had any consultation on the subject.

A brief explanation may suffice to show how this was done. The principles which produced this result were control and *harmony*.

The control of Senate committee rested with the chairman, Gen. McDougall, while the stirring speech and judicious after action of Mr. Sargent gave him virtually the control of the House committee, although not its Chairman. On Mr. McDougall, as Chairman, rested the responsibility of preparing such a bill as would receive the sanction of his committee, while upon the House side that

power was given to a sub-committee, and by that sub-committee delegated to Mr. Sargent.

I may here mention that I had been appointed Secretary of the Senate Pacific Railroad Committee, having charge of all their papers, etc., being present at their meetings, and having the privilege of the floor of Senate, while upon motion of Mr. Sargent, I was appointed Clerk of the House sub-committee, who held their meetings in our committee room, had the privilege of the floor of the House, and I afterwards acted as Clerk of the main House committee.

At the time of first meeting of the House committee, a number of bills had been introduced into the House and Senate, and it soon became evident that unless some *unanimity of action* were had, that no Pacific Railroad bill would pass the present session of Congress.

With a view of harmonizing and combining the strength of the three most prominent interests, the Rollins bill was framed, taking in and making the whole of these grants to the three companies; the eastern end being given to the Pawnee, Leavenworth and Western Railroad, the central portion to the Perham Company, and the western end to our company. This was the first move under *the* principle of harmonized action. As it combined three of the most active influences, it was a preliminary step in the right direction.

The whole matter being now in the hands of the sub-committee, and by them delegated to Mr. Sargent, the following important alteration was first made. The name of the Peoples' Pacific Railroad, or Perham Company, was left out entirely, leaving the central section or division open to corporators, as in the Curtis bill, and leaving the ends as first arranged, for the following reasons:

Upon investigation it was satisfactorily ascertained, that the Perham Company had not the strength or influence they claimed. The managers of their affairs claimed so much for their company, and made such pretentious demands that it became necessary to make an investigation as to their responsibility and standing, the result of which was decidedly against the policy of retaining them in the bill. Again, it was evident that one of the strongest features of the Curtis bill, was in the provision making grants to corporators named in the bill, as the list comprehended prominent railroad men and capitalists from all the principal lines of road in the

United States. Their names being given in by delegations from the various States, of course interested members of those delegations in favor of the bill, and combined a strength and influence which could not otherwise be had. The absence of this feature in the Rollins bill, was the absence of great strength, and after weighing the anticipated opposition of the Perham Company against the increased strength of the bill, with this feature restored, Mr. Sargent, sustained by my advice and the results of his inquiries with regard to that company, decided to throw them out, believing that the bill could not otherwise be passed, and the final result proved the correctness of these conclusions.

When this became known to the Perham Company, as a matter of course their fierce opposition was encountered, and a determined and bitter warfare kept up, not only against our company, but finally against the bill itself. Pamphlets were written and laid on the desks of members and Senators, absurd statements with regard to bribery, fraud, etc., were freely circulated, and every effort made to poison and prejudice the minds of members against the bill, but as it appears, all in vain.

This bill emanated from Mr. Sargent's hands, shorn of its excrescences, the appropriations were increased, where an increase was wanted, the sections reduced to twenty miles in the mountains, the Nevada company recognized, the right of other companies in California to join without our consent, stricken out, the width of right of way made four hundred feet. Provision was made for an Iowa branch to reconcile that interest; the bonds and interest were to be repaid entirely in transportation and service for the Government, and no per centage deducted.

The wording of the bill was very similar to that of the Curtis bill. Room was left for the corporators to build about one thousand miles. Nearly the whole of the sections and provisions of the bill related to the Central or Union Pacific Railroad Company, who appeared to be prominent throughout, while the end companies were disposed of in a few words, such as giving them the same rights, privileges, grants, etc. The word dollar did not occur in the whole bill. The entire issue of bonds were limited to the number of fifty thousand. It appeared to be, *what it really was*, Mr. Curtis' bill very greatly improved, and as such commended itself to the practical good sense of the Congress who have endorsed it.

As this bill left Mr. Sargent's hands, it was approved and endorsed by the sub-committee, with but one single alteration, and that consisted only in leaving the number of sections of land per mile blank.

I immediately prepared a copy of the bill, as approved by sub-committee, and laid it before Gen. McDougall, going over the whole bill in detail with him; and although, while approving it generally, he did not fully concur in all its details, yet so important did he conceive harmonious action to be, that waiving all other considerations, he agreed (with the concurrence of his committee), to report this bill as it was, word for word, directing me to call a meeting for the following day, February 23, 1862, for the purpose of obtaining the sanction of his committee.

Five days afterward, February 25th, by direction of his committee, he reported the bill to the Senate, asked to have it printed and referred back to his committee, which was done a few days afterward, March 4th.

Mr. Campbell, Chairman of the House committee, having, by direction of his committee, reported the same bill to the House, where it was printed and referred back to his committee; and this is how both House and Senate committees adopted and reported the same bill to their respective Houses.

The plan of bill having now been settled and decided upon, being printed and before the public, it was of course open to criticism and amendments.

As was anticipated, the Iowa and Chicago interest revived the old local quarrel between Missouri and Iowa, and demanded amendments calculated to advance their own, and to prejudice the Kansas and Missouri interests. Many concessions were made to them and they appeared satisfied.

Next the great Northwest were agrieved, and demanded a line from Minnesota to South Pass. This was finally compromised by providing, that whenever a road should be built across Minnesota or Iowa to Sioux City, then a branch should be built from Sioux City to connect with Pacific Railroad line at a point not farther west than the one hundred and second parallel of longitude, giving them six sections of land per mile, and half the number of bonds per mile.

Various minor amendments were made, and finally the bill was reported to the House, March 14th, printed with the amendments,

and made the special order for March 25th. It was again postponed on account of the Tax bill till April 1st, and again till April 8th, when the Tax bill having passed the House, the Speaker stated the business next in order to be the consideration of the Pacific Railroad bill.

Mr. Stevens raised the question of order, that as this bill contemplated an appropriation it should go to the Committee of the Whole on the state of the Union. After some debate the Speaker sustained the point of order.

Mr. Campbell moved that the rules be suspended, etc.

Mr. Lovejoy asked, before a vote was taken, to submit an amendment for the purpose of having it printed.

The rules were suspended—Mr. Dawes in the chair—and the committee proceeded to the consideration, as a special order, of Bill No. 364, etc.

Mr. Campbell moved, and by unanimous consent the first reading of the bill was suspended.

Mr. Campbell then addressed the committee, explaining the features of the bill and giving much statistical information.

Mr. Phelps, of California, then obtained the floor, but yielded to Mr. Cobb, who moved the committee rise, it being 4 P. M. At 4:10 the House adjourned.

April 9th Mr. Campbell moved that the substitute, reported yesterday, be ordered printed.

House went into Committee of the Whole on Pacific Railroad —Mr. Dawes in the Chair—and Mr. Phelps addressed committee in favor of the bill for about one hour.

Mr. Kelly, of Pennsylvania, then followed in a speech of about thirty minutes.

Mr. Sargent then followed with a speech of about one hour.

Mr. Campbell then moved that the committee rise.

Mr. Lovejoy asked Mr. Campbell to postpone his motion, that they might go into the House and postpone the special order, but Mr. Campbell declined, and the committee rose.

Mr. Lovejoy then moved to postpone the special order to one week from Monday next.

Mr. Campell rose to a point of order, that Mr. Lovejoy's motion was not in order except by unanimous consent.

Speaker overruled the point of order.

Mr. Vallandingham then rose to a point of order, that the House

could not postpone a special order in the Committee of the Whole, except by a two-thirds vote, under a suspension of the rules.

Speaker overruled it, and pending the question, Mr. Vallandingham moved an adjournment, which was carried at 4:10.

April 10th, Mr. Lovejoy stated the reason why he desired to postpone the special order was, to give time to consider the bill. He had consulted with select committee and finds they are willing to postpone for one week; he, therefore, modifying his motion accordingly.

Mr. Campbell, finding a disposition on all sides, to give the Pacific Railroad that consideration to which it was entitled, and as the consideration of the Tax bill had prevented examination of this bill, and as the substitute had only just been printed, yielded to this disposition for a few days.

Mr. Stevens moved to amend so as to postpone until a week from Monday next.

Mr. Sargent called for the yeas and nays. Not ordered.

Mr. Campbell called for tellers, which were ordered.

Mr. Stevens' amendment disagreed to. Question recurring on Mr. Lovejoy's motion, it was agreed to.

Mr. Stevens then asked to have some amendments printed which he desired to offer.

April 17th, Mr. Campbell moved to close general debate in one hour, but as objection was made, withdrew his motion.

House resolved itself into Committee of the Whole—Mr. Hickman in the chair—and Mr. Lovejoy had the floor.

Mr. Lovejoy attacked the bill, severing it section by section; he endeavored to create the impression that the bill was so defective that a Pacific Railroad could not be built under it; that the grants of land were too bountiful; that the provision exempting them from taxation was unheard of—that it would absorb so large a portion of public land, as to render the homestead policy entirely useless.

He did not regard it as a military necessity; he doubted whether it was intended ever to build the road under the bill; the ends might, but the center would not be built; he depreeated the policy of employing companies at the ends, and was in favor of having but one company to build the entire road, etc., etc.

The true cause of Mr. Lovejoy's opposition arose from the fact that he was probably enlisted in favor of Perham Company, who

were not recognized in the bill of committees, whose bill he introduced as a substitute immediately after his speech, and had it printed. This bill gave all the grants to the Perham Company, and was accompanied by pamphlets, written by some one in Perham's interest, attacking the committees' bill, and recommending the adoption of the Perham bill in its place.

After Mr. Lovejoy had concluded, Mr. Cradlebaugh obtained the floor and spoke for about twenty minutes in favor of the bill. He gave a description of the silver mines of Washoe, and the vast business which would accrue to the road from its location through that Territory.

He was followed by Mr. Dunn, of Indiana, who made a rambling speech, the object of which seemed to be to decry the merits of the South Pass and contiguous routes, and to advocate the adoption of a route through Kansas and Colorado *via* the Cochetopa, or some other Pass thereabout, the precise location of which he did not seem to have a very clear idea, but through a country pronounced impracticable by Government surveys. Mr. Dunn spoke about one hour.

Mr. Dunn was followed by Mr. Edwards, of New Hampshire, in a speech, in which he declared himself in favor of a Pacific Railroad, but was not prepared to commit himself in favor of the committees' bill.

He was followed by Mr. Wilson, of Iowa, who, while declaring himself in favor of a Pacific Railroad, found a good deal of fault with the committee bill, and indicated numerous amendments which he considered absolutely necessary, before he could give it his support.

Mr. Wilson was followed by Mr. Watts, of New Mexico, who made a good humored, practical speech, full of good, sound common sense, and it had much weight, from the fact that he advocated the bill of the committees, which precluded New Mexico from enjoying the benefits of the bill; he said he would, and he did stand by the bill of the committee,

Mr. Pike, of Maine, followed in a speech favoring the postponement of the whole subject till the next session of Congress, his speech leading the movement to postpone the bill, of which there was really great danger.

He was answered by Judge Kelly, of Pennsylvania, who gave very excellent reasons why this bill should not be postponed.

Mr. Fessenden, of Maine, spoke in favor of Pacific Railroad, but objected to the bill of the committee, and favored the substitute of Mr. Lovejoy.

Mr. Morrill, of Vermont, followed Mr. Fessenden. He spoke against the passage of the bill at the present time, and advocated its postponement till the next session of Congress.

Mr. Blair answered Mr. Morrill's arguments effectually, and severely criticised the disposition shown to organize local hostility to the measure.

The debate of the day was closed by Mr. Campbell, who ably answered the arguments of Mr. Lovejoy and others. He pointed out the inconsistencies of the Perham bill, etc.

Committee rose, and House adjourned at 4:30.

April 18th, Mr. White, of Indiana, spoke against the bill—he was in favor of giving the grants to but one company, of recommitting; the bill of committee was full of objections.

Mr. Sheffield also spoke unfavorably, and on motion of Mr. Lovejoy, the bill was postponed to Monday week, April 28th.

The result of general debate up to this time, developed much hostility to the bill of committee, and gave uneasiness to the friends of end companies.

Monday, April 28th, Mr. Campbell said:

"Mr. Speaker: The Committee on Pacific Railroad have had a further meeting during the past week, and adopted some of the suggestions which were made here in general debate, and have instructed me to report an amendment. If the amendment of the gentleman from Illinois, Mr. Lovejoy, be withdrawn or voted down, the committee will recommend the adoption of the amendment I now present in lieu of the committee substitute. This question is the special order in Committee of the Whole while on state of the Union, and I give notice, that I will call it up to-morrow after the morning hours. I now move that the amendment I now submit, be ordered to be printed."

Motion agreed to.

April 30th, Mr. Campbell moved that the House resolve itself into Committee of the Whole on Pacific Railroad Bill, and that all debate be closed in five minutes.

Motion agreed to.

The bill was taken up to be perfected, and for that purpose to be read section by section.

On motion of Mr. Wilson, of Iowa, the first section of the committees' bill, relating to the incorporation of the Central Company, was amended so as to define more fully, the powers and duties of the incorporators.

Mr. White, of Indiana, moved that five Commissioners be appointed by the Secretary of the Interior, to act with those named in the bill, in the organization of the company, and also that the Secretary of the Interior appoint two Directors, after the organization, on the part of the Government. He thought the interest of the Government should be protected, as it would have millions invested in the road. Adopted.

A large number of names were inserted as Commissioners, and the enemies of the bill endeavored to make these additions the occasion of ridicule, when Mr. Sargent said it was time such amendments were voted down. The position of Commissioner entailed only hard work without pay, and gentlemen could not have read the bill aright who sought to get their friends in as corporators.

Mr. Morrill, of Vermont, moved to amend so as to require the subscriptions to the stock to be paid into the Treasury of the United States.

Mr. Sargent opposed this, as making the United States the treasury of a private company. The Treasurer of the United States has his own peculiar functions to perform in handling public money, and ought not to have the handling of private funds. It was never intended to use the vaults of the United States for the keeping of private funds.

Amendment withdrawn.

Mr. Stevens, of Pennsylvania, renewed it so far as to require ten per cent. to be paid into the Treasury.

Mr. Campbell opposed the amendment. He could see no propriety in paying the funds of a private company into the Treasury of the United States.

Without coming to any conclusion the committee rose.

May 1st, the House resolved itself into Committee of the Whole and resumed the consideration of the Pacific Railroad bill. Mr. Stevens' amendment was so modified as to require ten per cent. to be paid into the treasury of the company, and adopted.

Mr. Morrill returned to the charge, and moved that one half of the capital stock should be subscribed for, and $10,000,000 be actually paid into the Treasury of the United States, before the com-

pany should have a right to organize. He wanted a genuine working company. It was usual to require the whole stock to be subscribed. Any man could, by paying $20,000, get possession of all the grants and funds granted in the bill.

Mr. Campbell said it was unusual to require more than five per cent. to be paid before organization. We required ten. The company could not draw a dollar from the Treasury until millions had been subscribed, and part of the road built. The gentleman from Vermont was opposed to the whole scheme at this time, and it was evidently the result of that opposition which led him to propose to have $10,000,000 placed by the company in the Treasury of the United States. No company could afford to have so much dead capital. The Government had guarantees enough. He hoped the friends of the bill would vote down the amendment.

At this point in the proceedings Mr. Lovejoy endeavored, vigorously, to procure a substitution of the Perham bill for that of the committee, which led to a long debate on questions of order, which was participated in by Messrs. Sargent, Stevens, Campbell, White, and Lovejoy, and ended in the withdrawal of the amendment by Mr. Lovejoy.

Mr. Sheffield, of Rhode Island, moved to require ten per cent. to be paid on 50,000 shares, instead of 2,000. He thought the amount entirely too small. He deemed it unsafe to the public to allow a corporation of this magnitude, capable to perform so much mischief as this corporation may perform, to be launched out on so small capital.

Mr. Phelps, of California, regretted very much to see this kind of amendments offered. He could not think they were offered with any other purpose than to embarrass the bill. The fact that it was a large corporation, did not justify in embarrassing it with conditions.

Amendment lost.

Mr. Shanks, of Indiana, moved to strike out the right to take from the public lands stone, earth and timber for the construction of the road. He thought the alternate sections for ten miles on either side of the road enough.

Mr. Sargent opposed the amendment. It could not injure the Government to allow the company to take the stone and timber along the route, and apply it to the uses of the road, when at pres-

ent it is of no use whatever, and may never be, unless the road is built.

Amendment lost.

Mr. White moved to reduce the right of way from four hundred to two hundred feet. Mr. Campbell had advised with practical engineers on the subject, and thought four hundred not too much, considering the heavy embankments and cuttings.

Amendment withdrawn.

On motion of Mr. Stevens, the iron to be used in the road was required to be of American manufacture.

Mr. Cradlebaugh proposed that the lands, after being conveyed to the company should be opened to prospectors for metals, and providing that a jury assess damages.

Mr. Sargent was opposed to patch work legislation in regard to the mines. Mineral lands were excepted in the bill. The local care of the mines had been left to the people. When that system was changed he desired it should be by a carefully considered bill, not by incidental legislation.

Amendment lost.

Mr. Wilson moved to reduce the rate of interest on the bonds from six to five per cent., which was opposed by Mr. Campbell, and lost.

Mr. Holman moved to insert a provision that the road should remain a public highway for the use of the Government of the United States free of charge.

Mr. Campbell opposed the amendment. The Government must come forward with a liberal hand, or the enterprise must be abandoned forever. The necessity was upon us. The question is whether we shall hold our Pacific possessions.

Amendment lost.

Mr. Shelbarger, of Ohio, moved that surveys be first made of a through route, demonstrating its practicability before any bonds should issue.

Mr. Campbell answered him, and the amendment was lost.

The committee then rose.

On Monday, May 5th, a test vote was taken on the question of going into Committee of the Whole on the Pacific Railroad Bill, and resulted, 56 yeas, 49 nays. Encouraged by this the friends of the bill took fresh courage, and prepared for the conclusive struggle.

Messrs. Campbell and Sargent proposed, on behalf of the committee a great many amendments to the pending bill, changing the starting point of the Central Company from the western boundary of Kansas to the one hundred and second meridian of longitude, striking out the Nevada company, etc. The change in the starting point, and certain additional privileges granted to the Iowa branch, were the results of a compromise between conflicting interests, that had given infinite trouble, labor and anxiety to the friends of the measure. The compromise satisfied all parties, and did justice to all, and the effect of the cheerful cooperation of all parties who favored *a* bill against those who were opposed to *all* bills, was apparent throughout this day.

Mr. Kellogg, of Illinois, moved to strike out of the bill the ninth section, providing for the companies on the ends. He had no objection to that portion of the bill providing for a road from the one hundred and second meridian of longitude to the State line of California. But the bill proposed to build an independent road in California and one in Kansas. He was opposed to it. The center would never be built. The bill proposed three roads.

Mr. Campbell replied, the amendments would destroy the whole bill. Greater inducements were offered to build the central portion. The ends had but $16,000 per mile, the center $48,000 and $32,000. Government had a mortgage on the whole.

Amendment lost.

Mr. Kellogg moved to amend so as to require forty miles of the Central part to be built before any part of the bonds should issue. He wanted some security to the country that the central portion would be built. Why not let the people subscribe to the whole road? Why make three charters instead of one? He called upon the friends of the bill to give this poor guarantee that the central would be built.

Mr. Sargent said, because we are friends of the bill we vote down, when we are able, all such amendments. What security to the Government or good to any body, would arise from compelling the company to go five hundred miles into the wilderness to build forty miles of road without connection with any other road? The rails, ties, etc., would have to be carried in wagons. The gentleman would impose a useless, ridiculous task. Mr. Sargent was in favor of a Pacific Railroad *now*, and for that reason was in favor of commencing at the ends, not in the middle. Books of all the compa-

nies would be open for subscriptions, for much capital would be needed from the people.

The amendment was lost.

Mr. Lovejoy moved to insert a provision, that if a road is not built from the Missouri river to the city of Saeramento by the 1st of January, 1874, the road should be forfeited. He believed, notwithstanding the views of the eommittee, the bill eould not build the road. It would build the ends only. He thought his amendment would test the sincerity of the friends of the bill in their purpose to eonstruct the road across the continent.

Mr. Campbell had no objection to the amendment. He believed Congress would always act liberally towards any company endeavoring to fulfil its obligations.

The amendment was adopted.

Mr. Morrill, of Vermont moved to amend so that no bonds should issue, or any lands be granted until surveys should demonstrate the practicability of the route, or until, in the opinion of the President of the United States, the eireumstances of the eountry shall justify the building of the road. He had been astonished that a matter of so much importanee should be considered in so thin a House. His amendment would prevent anything being done that could involve the Government, till the circumstanees of the country would warrant it. At the proper time he would be in favor of a railroad. He was not in favor of a sham. Under the bill we would get somebody to take a vast quantity of bonds and public lands, but would get no road. He desired a practieal survey. We had never had anything but picture-books—mere barometrical surveys. Those surveys show that there are extreme difficulties to be overcome. He regarded the bill as purely ornamental; he was opposed to increasing our annual taxation five or six millions, as this bill would.

Mr. Sargent said that the gentleman did not desire to arrest legislation when the tax bill was under eonsideration, although they had to resort to frequent calls of the House, to get a quorum. They were there to attend to the legislation of the country, and were not exeused by the remissness of others. The gentleman would not go on with the work till more surveys, and henee more pieture-books had been made. But there was more in those picture-books, than the gentleman seemed aware of. He showed by the abstract of grades, as shown by Government surveys, the practica-

bility of the route, and explained the value of barometrical reconnoisances, illustrations by the surveys made by our company over the Sierras. The gentleman was in favor of a Pacific Railroad, except when it could be passed. If we continue to put off the Pacific Railroad till the war debt is paid, we will never have it. We need it to develop the resources of the country, and the greater the debt, the more we would need such development, as a farmer would need to more carefully cultivate his farm if he fell into debt. The road was a political necessity. The present generation in California was loyal, but neglect all the interests of the State, and squeeze it with taxation, and a new generation might ask what they were gaining. We must break down the barrier between the two great sections of the country—legislate for the future as well as the present. He trusted that the bill now so near completion would be sent to its final vote without insidious amendments, distractive of its object.

The amendment was lost.

Mr. Aldrich moved to insert a provision for a northern road from the western boundary of Minnesota to Puget Sound, and was humorously replied to by Mr Watts, and the amendment rejected.

Mr. Kellogg again moved his amendment, to have the forty miles of the central division built first, which Mr. Stevens said was like the boy, who, in digging for a squirrel, commenced at the bottom of the hole and dug upwards.

His motion again failed.

The committee having completed its labors, on motion of Mr. Campbell, rose and reported the bill to the House, where it was considered, engrossed and read a third time, and ordered to be printed with the amendments, and by unanimous consent, the final vote on the bill was set for the next day at two o'clock P. M.

At two o'clock on May 6th, the speaker stated that the hour had arrived for taking the vote on the Pacific Railroad bill, and the question being taken by yeas and nays, the bill passed—yeas 79, nays 49. And thus the Pacific Railroad bill passed the House.

SENATE PROCEEDINGS.

May 7th, the bill having been engrossed, was reported to Senate from the House, and on motion of Mr. McDougall, was referred to his committee. He stated that it was in substance the same bill

reported by Senate committee to Senate, and gave notice that he should bring it to the attention of the Senate at an early day.

On motion of Mr. Lane, of Kansas, four new members were added to the committee: Messrs. Wade, Lane, of Kansas, Browning and Kennedy, and at Mr. McDougall's request, I called a meeting of Senate committee for next day, May 8th.

May 8th a meeting of Senate committee was held, where the bill was read and discussed, the general sense of the committee being to agree to report it with very slight amendments. It was agreed to meet again on Monday the 11th, and report the bill immediately.

May 11th some of the members of the committee not having returned, meeting was postponed till to-morrow, Tuesday, 12th.

May 12th, committee met at 9 A. M., and completed their work on the bill. Most of the amendments were verbal and unimportant, except the one with regard to Iowa roads.

The House bill required the main Iowa branch to be completed in the same time with the Kansas road, viz: one hundred miles per year, etc. In view of the fact that no railroads were completed across Iowa, the Senate committee did not require them to commence until these connections were completed. The amendment was made in a spirit of liberality and fairness, but made much trouble afterward.

Mr. McDougall reported the bill to Senate May 12th, and gave notice that on to-morrow he should move to have the bill made the special order for Thursday, the 15th, on account of the expected absence of the two Missouri Senators.

It was soon afterwards ascertained that the Iowa and Chicago interests were opposed to the Senate amendment as to the Iowa branch, also to the Kansas road, and would endeavor to defeat the Kansas company, if all companies had to be excluded. They set on foot many reports calculated to prejudice Senators and others, and when the bill was called up, this opposition began to manifest itself strongly. The Senate refused to accede to Mr. McDougalls's motion to make the bill a special order. But Mr. McDougall succeeded in getting it in such position as made it the unfinished business of the morning hour each day until disposed of.

Tuesday, May 20th, Mr. McDougall called up the Pacific Railroad bill.

Mr. Fessenden opposed taking it up. Mr. Wade asked that it be postponed a day or two. Mr. Clark opposed taking it up, also Mr.

Howe and Mr. Wilson. Mr. McDougall persisting, a vote was taken, and Mr. McDougall's motion prevailed.

Mr. Harlan, of Iowa, then gave notice that he should move that the bill be recommitted to the Committee on Public Lands, of which he was Chairman, assigning various reasons therefor, but the real one being, to get hold of it, so as to restore the House amendment with regard to the Iowa branch, and make others prejudicial to the interests of the Kansas road. By insisting on the reading of the bill until the morning hour had expired, Mr. Harlan was defeated in his attempt to get his motion in that day, but his motion was next in order, after the reading of the bill had been concluded.

At this stage of proceedings the Tax bill came up for consideration, and nothing more was done with the Pacific Railroad until after its passage.

Ad interim, I, with others exerted myself to allay the opposition of Messrs. Harlan and Grimes. Here let me do Mr. McDougall the justice to say that he agreed for himself and his committee, to yield to Mr. Harlan's views—restoring the House amendment with regard to Iowa branch. I also procured the assent of the Kansas company to shortening their line from the one hundred and second to the one-hundredth meridian, and also to some other alterations, insisted upon by Mr. Harlan, which withdrew his opposition. Mr. Harlan was subsequently added to the Pacific Railroad Committee, and entirely gave up his idea of having the bill referred to the Public Land Committee.

At several subsequent meetings of the committee, Mr. Harlan presented his amendments, which were adopted, with one exception, and on that a compromise was made, to which Mr. Harlan reluctantly consented. He insisted on making Fort Kearney the point where the Kansas road should terminate. But it was finally decided by a vote in the committee, to be the one-hundredth meridian of longitude, between the Platte and Republican rivers. And to the bill in this shape the committee agreed to stand.

On June 9th, Mr. McDougall called the bill up.

Mr. Wade insisted upon taking up a bill of his own.

Mr. McDougall objected, and called for the yeas and nays.

Mr. Wade's motion was sustained, and his bill considered and passed.

Mr. McDougall then tried to make it a special order, but Mr. Fessenden opposed. He, however, succeeded in having the bill or-

dered printed with the final amendments of the committee, and to come up in the Senate to-morrow at one P. M.

June 10th, other matters crowded the Pacific Railroad bill out until late in the afternoon, when Mr. McDougall made another attempt to have the bill made the special order for to-morrow, June 11th. In this he was opposed by Messrs. Wade and Clark—both of his committee—and Mr. Wilson, and finally, on Messrs. Wade, Wilson and Clark's advice, they agreeing, if he would let it lie over, to take hold of it and assist him to press it through, he reluctantly consented, rather than give occasion of offense to three Senators of influence, who were really friendly to the bill.

Wednesday, June 11th, Mr. Latham called up the Pacific Railroad bill, and moved to postpone all prior orders, to which Mr. Wilson objected, as he wanted another subject disposed of. Messrs. McDougall, Harlan, Latham, and Pomeroy insisting, the yeas and nays were ordered, and the motion agreed to.

Mr. McDougall announced that the committee had agreed upon the amendments unanimously, and the Senate proceeded to their consideration.

Mr. Trumbull wished to know the reason for changing the House bill in regard of meridian of longitude at commencement.

Mr. Trumbull raised the point, that it would bring the commencement within the State of Kansas, and the United States had no power to grant rights, etc., within a State.

Mr. Pomeroy explained, but not satisfying Mr. Trumbull.

Mr. Collamer called on Mr. McDougall to explain the general features of the bill, which he did occupying about half an hour.

Mr. Lane, of Kansas, moved to postpone the bill and make it special order for one o'clock to-morrow. It gave rise to a debate. Messrs. Fessenden, Morrill, Trumbull and Wilson, opposed making it a special order. Messrs. McDougall, Latham, Lane and Browning, advocating it. Mr. Lane finally withdrew his motion, and on motion of Mr. Wilson its further consideration was postponed until to-morrow, at one P. M. June 12th, Mr. Latham made his speech on the Pacific Railroad. After disposing of a few amendments, Mr. Morrill commenced a speech, when, on motion of Mr. Doolittle, the Senate went into executive session, with the understanding that consideration of the bill should be resumed on the following day.

June 13th, Pacific Railroad bill came up as unfinished business,

but there being a general desire to act on the naval appropriation bill, the Chairman of the Pacific Railroad Committee yielded, with the expectation that the naval bill would occupy but a short time. It, however, took up the time until Senate adjourned, without concluding it, and nothing was done on the Pacific Railroad bill.

June 16th, the naval appropriation bill came up as unfinished business, and upon its passage, the Vice President gave notice that the Pacific Railroad bill was before the Senate.

Mr. Hale asked consent of Mr. McDougall to introduce a resolution, fixing the hour of daily meeting at eleven, instead of twelve o'clock. Mr. Latham suggested to the Senate to lay aside the Pacific Railroad bill informally, to consider the resolution. Mr. McDougall gave way; but finding it would lead to discussion, proposed to let the resolution go over till to-morrow; but a vote being taken on it, the resolution was taken up, and consumed all the balance of the day. Mr. McDougall again took the floor and declared his intention not to yield again except for an adjournment, which gave him the right of the floor at one P. M. to-morrow.

June 17th, the Pacific Railroad bill came up in Senate at one P. M. for the first time in earnest, the Senate resuming its consideration as in Committee of the Whole. The debates of the day were voluminous and interesting, and will be found in the *Globe*, containing proceedings of June 17th.

June 18th, Senate engaged on amendments to Pacific Railroad bill all day. (See debates of *Globe*, proceedings of June 18th.)

June 19th, Senate engaged on Pacific Railroad bill all day. (See debates of *Globe*, proceedings of June 19th.)

June 20th, resuming the consideration of Pacific Railroad bill, the Senate completed their labors upon it, and it finally passed by a vote of 35 to 5. Those voting against it, being Messrs. Howe, King, Pearce, Wilkinson and Wright; Mr. Ten Eyck asking to be excused from voting, and Mr. Powell stating that he was paired with Mr. Simmons, but should have voted no.

The only unfavorable alterations of any importance were made by the New England Senators. But with regard to retaining the per centage, and as to the mode of repayment to the United States, these might perhaps have been remedied by a Committee of Conference, but it was thought best not to risk sending the bill back again to the Senate.

June 24th, the bill as passed was referred to the House Commit-

tee, and by them reported to the House on June 24th, with a recommendation that the House do concur in all the Senate amendments, which was accordingly done—the House concurring by a vote of 104 to 21.

The last action of the House on the Pacific Railroad, was upon a motion of Mr. Sargent, to print 2,500 copies of the bill, which was agreed to.

The bill was signed by the President, and became a law on July 1st, 1862.

The bill having passed, I immediately prepared a map and designation of our route as required by Section 7 of the act, which says that "Whenever said companies shall designate the general route of their road, and file a map of the same in the office of the Secretary of the Interior, he shall cause the lands for fifteen miles on each side of said route or routes, to be withdrawn from private enterprise, emption and sale."

This was so altered in the bill, for the purpose of keeping speculators and others from taking up the Railroad lands before they could file their final map.

I found Messrs. Smith and Usher, Secretary and Assistant Secretary of the Interior, ready and willing to do anything in their power to advance the interests of the Pacific Railroad, and in advance of the signing of the bill by the President, they allowed me to file the necessary papers, agreeing to forward the proper instructions to the land offices, to withdraw such lands from market, upon the signing of the bill.

I left Washington Friday, June 27th, for New York, for the purpose of making necessary inquiries, and securing provisional contracts, if possible, for the Iron Equipment, etc., for the first fifty miles of our road. My desire being to make such contracts, if possible, for Government bonds—and so that, if necessary, the first fifty miles could be completed by the fall of 1863.

Finding that Iron was rapidly advancing in price, and mills beginning to refuse to take orders, most of them being filled up with orders for many months ahead, I placed matters in the hands of G. T. M. Davis, Esq., with instructions to immediately close some kind of arrangement with iron, locomotive and car men, upon the best terms he could get, before further advances took place. Any contract or agreement not to be binding on us until ratified by the Central Pacific Railroad Company.

Mr. Davis succeeded in making a contract with Norris & Co., of Philadelphia, for eight locomotives, deliverable in January, to be paid for entirely in Government bonds, when issued. (See contract.) Also, obtained a proposition from the Lackawana or Scranton Iron Company, for 5,000 tons of rails, deliverable in time for the completion of our first fifty miles as proposed. (See letter of Mr. Davis.) Also, obtained a proposition from Wason & Co., of Springfield, for eight passenger, four baggage and sixty freight cars, deliverable as above. (See proposition.)

All of these contracts and propositions to be subject to the approval of our Board of Directors, which was required to be given within thirty days from July 21, 1862, they otherwise to be void. Unless these contracts are accepted by our company, I doubt if it will be possible to otherwise arrange to procure this material so that the first fifty miles can be finished by the fall of 1863, which I regard as quite essential to be done, in order to complete the entire line through California as contemplated in the bill.

Herewith accompanying, you will find :

Three contracts with Norris & Co., of Philadelphia, for locomotives.

Proposition of Danforth, Cook & Co., of Patterson, for locomotives.

Proposition of Wason & Co., of Springfield, for cars.

Proposition of Lackawana Iron Company, for Iron.

Letter from G. T. M. Davis, explaining the results of his negotiations.

Deeming it of importance that the President should fix the guage of road as soon as possible, I procured several letters from influential Railroad managers, among which is one from Mr. Garrett, President of the Baltimore and Ohio Railroad, recommending a five feet gauge, and forwarded them to Mr. Sargent in Washington, who went to see the President several times about the matter, but found him too much occupied to take the time necessary for a proper examination.

Mr. Sargent also kindly endeavored to procure the President, to establish the west base of the Sierra Nevadas, but owing to the above causes was obliged to postpone it until next winter.

I would further state that a resolution was passed by the Senate making an appropriation out of the contingent fund of the Senate for the purpose of altering the plates and printing 1,000 copies

each of certain maps in possession of the Bureau Topographical Engineers; upon which maps so altered you will find the line of our Railroad, as well as others in California, laid down.

These maps were freely distributed among Senators, Representatives and others, and proved of the greatest assistance in furthering our interests in Washington.

I would also state, that in pursuance of an agreement with Hon. S. A. McDougall and Hon. T. G. Phelps, made in Washington, I assigned to certain parties representing the interests of the San Francisco and San Jose Road, the rights, grants and franchises, given us for that portion of the road between Sacramento and San Francisco. Also, that in order to provide for the contingency of the non-passage of the Pacific Railroad bill, I prepared early in the session a bill making a grant of lands for railroads in California, including our own; which bill was introduced into the House by Hon. A. A. Sargent, and into the Senate by Hon. M. S. Latham, and referred to the appropriate committee, but the aspect of the Pacific Railroad affairs became so encouraging that all efforts were concentrated upon the latter, and consequently nothing further was done with the land bills.

In justice to the Hon. Henry Wilson, of Massachusetts, than whom the Pacific Railroad had not a firmer or truer friend, I desire to state that to him are we indebted for the passage of that feature of the bill giving us the timber on mineral lands.

As the bill passed the House, mineral lands were excepted from the operations of the act.

Knowing that nearly all our lands in the Sierra Nevadas might possibly be decided to be mineral lands, and as no provision was made for our taking other lands in lieu thereof they would be lost to us.

Aware, also, that they were covered with timber, and that it was of the greatest importance to us in the future that we should have this timber for fuel, etc., I drew up a little amendment which read as follows: "But when the same shall contain timber, the timber thereon is hereby granted to said Railroad companies;" and when the bill, as it passed the House, came before the Senate committee urged upon them the importance of adopting this or a similar amendment, and the injustice of depriving us of both lands and timber, while if no mineral had existed on them, the provisions of the bill, as passed, would give us both lands and timber.

After discussion upon several occasions, although supported by Gen. McDougall, the Chairman, it was lost in committee, on a direct vote, by a majority of one, principally in consequence of the opposition of Mr. Cowan, of Pennsylvania, who conceived that we might find coal lands among the mineral lands, and then the timber would be necessary in order to work them.

Somewhat discouraged by the action of the committee on this particular point, I applied to several Senators friendly to the bill, to offer it as an amendment in Senate, but while they acknowledged its justice and importance, they did not like to offer in Senate an amendment rejected by committee.

As a last resource, I saw Senator Wilson, who, after an explanation, kindly offered to take charge of the amendment, and at the proper time offer and support it.

A record of the proceedings will show that he fulfilled his promise to the letter, the amendments passed, and to him, therefore, are we indebted for the passage of this feature, without which our land grants would have been comparatively worthless.

Having successfully accomplished the objects of my mission, I sailed from New York in the steamer Champion, July 21, 1862, arriving in San Francisco August 17, 1862.

* * * * * * * *

I have the honor to submit the following testimonial letter, signed by forty-six Congressional representatives and seventeen Senators, and by Mr. Forney, Secretary of Senate, approving my course with regard to the Pacific Railroad bill in Washington:

WASHINGTON, June 24, 1862.

T. D. JUDAH, Esq., of California—Dear Sir: Learning of your anticipated speedy departure for California on Pacific Railroad business, we cannot let this opportunity pass without tendering to you our warmest thanks for your valuable assistance in aiding the passage of the Pacific Railroad bill through Congress.

Your explorations and surveys in the Sierra Nevada Mountains have settled the question of practicability of the line, and enabled many members to vote confidently on the great measure, while your indefatigable exertions and intelligent explanations of the

practical features of the enterprise have gone very far to aid in its inauguration.

Very truly yours,

JAMES H. CAMPBELL,
Chairman Select Committee of Pacific Railroad.

A. A. SARGENT,
Of Sub-Committee of House.

REPRESENTATIVES.

R. Franchot,
Schuyler Colfax,
Wm. D. Kelly,
T. G. Phelps,
Frank F. Blair,
S. Edgerton,
J. H. Goodwin,
A. W. Clark,
Burt. Van Horn,
Augustns Frank,
H. G. Blake,
John A. Bingham,
W. H. Wallace,
R. E. Fenton,
I. N. Arnold,
John B. Alley,
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W. F. Kellogg,
Erastus Corning,
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John B. Steele,
Thaddeus Stevens,
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B. B. Van Valkenburgh,
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F. F. Lowe,
Elihu B. Washburn,
Saml. F. Worcester,
Wm. T. Cutter,
Cyrus Aldrich,
George W. Julian,
F. C. Beaman,
Theo. M. Pomeroy,
Alex. H. Rice,
C. B. Sedgwick.

SENATORS.

S. C. Pomeroy,
J. H. Lane,
A. Kennedy,
Daniel Clark,
H. B. Anthony
B. F. Wade,
Jas. A. McDougall,
Milton S. Latham,
J. W. Nesmith,
Edgar Cowan,
O. H. Browning,
J. B. Henderson,
R. Wilson,
L. M. Morrill,
John A. Wright,
Lyman Trumbull,
John C. Ten Eyck,
John W. Forney,
Secy. U. S. Senate.

Accompanying, please find :—

1—A set of all Pacific Railroad bills offered at this session of Congress; also Curtis' Bill.
2—Set of Pacific Railroad reports with maps.
3—Debates on Pacific Railroad in present Congress.
4—People's Pacific Railroad charter and address.
5—Two pamphlets against present bill, and answers.
6—Charter, etc., of Leavenworth, Pawnee and Western Railroad of Kansas.
7—Copy of assignment from Sacramento to San Francisco.
8—Three contracts with Norris & Co., for locomotives.
9—Proposition of Wason & Co., for Cars.
10—Proposition of Lackawana Iron Company for 5,000 tons of iron.
11—Proposition of Danforth, Cook & Co., for locomotives.
12—Letter of G. T. M. Davis, respecting iron contracts.
13—Letter of Wm. Garrett, President of Baltimore and Ohio Railroad respecting guage.
14—Letter of Henry Tyson, respecting guage.
15—Sundry letters respecting the working of engines on heavy grades.
16—Copy of bill granting lands in and of railroads in the State of California.

Trusting my course and action on this subject, while absent, will meet your endorsement and approval,

I am, very respectfully,

THEODORE D. JUDAH;

Chief Engineer and Accredited Agent C. P. R. R. Co. of California.

6

REPORT

OF THE

CHIEF ENGINEER

ON THE

PRELIMINARY SURVEY, COST OF CONSTRUCTION, AND ESTIMATED REVENUE,

OF THE

Central Pacific Railroad

OF CALIFORNIA,

ACROSS THE

SIERRA NEVADA MOUNTAINS,

FROM

SACRAMENTO TO THE EASTERN BOUNDARY OF CALIFORNIA.

OCTOBER 22, 1862.

Dup. of no. 7, v. 1

SACRAMENTO:
H. S. CROCKER & CO.'S PRINT, 107 J STREET.
1862.

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C. P. HUNTINGTON.....OF SACRAMENTO.
MARK HOPKINS.....OF SACRAMENTO.
D. W. STRONG.....OF DUTCH FLAT.
CHARLES MARSH.....OF NEVADA.

REPORT.

ENGINEER'S OFFICE,
CENTRAL PACIFIC R. R. OF CALIFORNIA.

SACRAMENTO, October 1, 1861.

TO THE PRESIDENT AND DIRECTORS OF THE CENTRAL PACIFIC RAILROAD COMPANY OF CALIFORNIA:

GENTLEMEN—Agreeably to your instructions, I have completed the preliminary survey of a Railroad across the Sierra Nevada Mountains, from the city of Sacramento to a point on the Truckee River, at the eastern base of the mountains; the results of which confirm the facts established by the barometrical reconnoisance made last fall.

A preliminary examination was made, and barometrical observations taken last fall upon three routes—one through El Dorado county *via* Georgetown, another *via* the present route (Illinoistown and Dutch Flat), and the third *via* Nevada and Henness Pass.

These observations demonstrated the existence of a route from Sacramento across the Sierra Nevadas, by which the summit could be attained with grades of 105 feet per mile; accordingly field parties were organized early in the spring, and a thorough Railroad Survey made, the results of which are embodied in the following Report, developing a line with lighter grades, less distance, and encountering fewer obstacles than found upon any other route or

line hitherto examined across the Sierra Nevada Mountains; and proving, by actual survey that the difficulties and formidable features of this range can be successfully overcome for Railroad purposes.

Among the objectionable features which render the Sierra Nevada Mountains formidable for Railroad operations, are found—

First. The great elevation to be overcome in crossing its summit, and the want of uniformity in its western slopes.

It will be observed that in crossing a summit of 7,000 feet in hight, an average grade of 100 feet per mile, can only be attained, with a distance or base of 70 miles. Should any irregularity of surface occur in this distance, the grade would be correspondingly lessened or increased, in conformity with such irregularity of surface.

When it is considered that the average length of the western slope of the Sierra Nevada Mountains, from summit to base, is only about 70 miles, and the general hight of its lowest passes about 7,000 feet, the difficulty of locating a Railroad line with 100-feet grades is correspondingly increased, as it becomes absolutely necessary to find ground upon which to preserve a general uniformity of grade.

In the present instance, the elevation of summit 7,000 feet above Sacramento, is reached by a maximum grade of 105 feet per mile; showing a remarkable regularity of surface, without which the ascent could not have been accomplished with this grade.

Secondly. From the impracticability of river crossings in the mountains.

To those unacquainted with the mountain topography of the western slope of the Sierra Nevadas, and accustomed to the lesser elevations and gentler slopes of the Atlantic States, it would be difficult to convey an adequate idea of the extensive proportions of the irregularities of surface which attach to these mountains.

The general course of the Sierras is north-westerly, and parallel to the line of the Pacific coast.

This western slope being at right angles, extends, therefore, in a southwesterly direction, which is the general course or direction of the rivers and streams upon its western slopes.

Between a point opposite the city of Sacramento (about latitude

38½) and Shasta (about 41 degrees), this western slope is intersected by numerous rivers, having their sources near the summit of the Sierras. They are as follows: The South Fork of American, Middle Fork and North Fork, Bear River, Deer Creek, South Fork of Yuba, Middle Fork, North Fork, the South, Middle and North Forks of Feather River.

These rivers run through gorges or canons, in many places from 1,000 to 2,000 feet in depth, with side slopes varying from perpendicular to an angle of forty-five degrees.

The ridges formed by these rivers are sharp, well defined, and in many places so narrow on top, as to leave barely room for a wagon road to be made without excavating surface of ridge.

The branches, also, of many of these rivers have worn out gorges as deep as those of the rivers, and present physical barriers to a line of communication either crossing them, or extending in a northerly and southerly direction.

These rivers are generally made the dividing lines between mountain counties, which are of oblong shape, long and narrow; the counties of El Dorado, Placer and Nevada, extending from base to summit of Sierra. The thoroughfares of travel extend into these counties along these ridges; the focus of travel for the large counties of El Dorada, Placer, Nevada and Sierra, being Sacramento (a portion of this travel, however, concentrating at Marysville).

No wagon road exists across the Middle Fork of the American. The inhabitants of El Dorado county, in order to reach the divide between Middle and North Fork of the American, by wagon, are obliged to proceed down to within eight or ten miles of the Sacramento valley, in order to obtain a crossing.

The towns of Forest Hill, Yankee Jim's, Todd's Valley, Michigan Bluffs, Bird's Flat, Sarahsville, etc., lying in the divide between the North and Middle Forks of the American, are reached by crossing the North Fork, about four miles above Auburn, at which point the road is excavated on the face of a steep side-hill above the river canon, which is about 1,000 feet high, closely following its bends and sinuosities; the hill upon each side being about four miles in length, or a total of eight miles in length; the grade for wagon road varying from 250 to 300 feet per mile.

Iowa Hill and Wisconsin Hill, although upon this same divide,

are separated from the above mentioned towns by two or three canons, or branches of the North Fork, running nearly parallel.

One of these canons is deeper and more precipitous than the crossing of North Fork, above Auburn; the descent into the canon being about one thousand five hundred perpendicular feet. A wagon road wide enough for a single team, with occasional turning-out places, has been built across, but a distance of ten miles of road is rendered necessary in order to reach across a direct line of about three miles, the grades being between three hundred and four hundred feet per mile.

From Iowa Hill to Illinoistown and Nevada, the canons of Bear River, of Steep Hollow, Greenhorn, Wolf Creek, and Deer Creek intervene.

Above Nevada, the South, Middle, and Main Yuba also intervene.

The present traveled stage road from Nevada to Eureka, etc., crosses South Yuba about eight miles from Nevada, the road descending in about two miles one thousand feet, and in the next five miles ascending two thousand feet, to the top of ridge.

Thus it will be seen that in order to reach the summit of Sierra Nevada, a Railroad line must avoid the crossings of any of the canons; for were it even practicable to follow down into them with a grade of one hundred feet per mile, it would still be necessary to retrace the line upon the opposite side, which would involve (in a canon of, say, one thousand feet in depth) the additional length and cost of twenty miles of line of maximum grade, with the crossings of side ravines and tributaries.

The *present line* pursues its course along an *unbroken ridge from base to summit of Sierras*, the only river crossing in the mountains being Little Bear River (a tributary of Main Bear River, about three miles above Dutch Flat), which is crossed at an elevation of fifty feet, and will require only about fifty feet span of bridge.

THIRDLY. IN ITS ENTIRELY AVOIDING THE SECOND SUMMIT OF THE SIERRA NEVADA MOUNTAINS.

A cross section of the main range of Sierra Nevada presents a profile showing two summits, with a range of elevated table-land lying between; thus, upon the profile of Lieutenant BECKWITH'S survey across the Sierra Nevada *via* Madelin Pass, are shown two distinct summits, thirty-five miles apart, with a range of elevated table-land between them.

The present Placerville wagon road to Washoe also crosses these two summits; passing the first range *via* Johnson's Pass, it descends into Bigler Lake Valley, and ascending again, crosses the second summit *via* Daggett's Pass, into Carson Valley.

Lake Bigler lies in this valley between the two summits—is about 35 miles long, and from 12 to 15 miles in width; is entirely surrounded by mountains and lofty peaks, excepting at one point on its western shore, where the Truckee River forms its outlet.

Running at first north-westerly about eight miles, then northerly about ten, thence north-easterly about twelve miles, the Truckee passes down between these two summits with a nearly uniform fall of about thirty-five feet per mile; thence sweeping round to the eastward, it passes through the second range or summit, at a depression where it seems to be entirely worn away down to the level of the river, thence pursuing its way through an extensive plain known as the Truckee Meadows; thence through the Washoe Mountains to the Big Bend; thence northerly about twenty miles, finds its way into Pyramid Lake.

At the Donner Lake Pass, where our line crosses the first summit of Sierra Nevada, the altitude of line is about 1,200 feet above the Truckee River. Donner Lake lies immediately beneath, at a depth of 1,000 feet.

Two long side ranges or spurs inclose the lake and its valley, declining in hight gradually to the Truckee River, about eight miles below.

Our line is carried down along the side-hill of the spur or range immediately above the lake, and upon its south side to the Truckee River, which point it reaches in a distance of eleven and a half miles of line, with an uniformly descending grade of 105 feet per mile from the summit.

The Truckee thus reached, all further difficulty of location ceases, as it pierces its way through all obstructions with an uniform descent not exceeding forty feet per mile, to the Humboldt Desert, which forms the sink of the Humboldt and Carson Rivers.

Thus, the second summit of Sierra Nevada and the crossing of the Washoe Mountains are entirely avoided; and from the western base to the summit of Sierra Nevada, the grade is uniformly ascending or level, there being no descending grade going eastward; while from the summit to Big Bend of Truckee or Humboldt Desert, a uniform grade is likewise maintained.

THE PROMINENT FEATURES OF THIS LINE MAY BE BRIEFLY ENUMERATED AS FOLLOWS:

1st. It crosses the Sierra Nevada Mountains, and reaches the Truekee River, in 123, and State line in 145 miles from Sacramento.
2d. Big Bend of Truckee, or Humboldt Desert, is reached in 178 miles.
3d. It crosses the State at nearly its narrowest width.
4th. It pursues nearly a direct course from Sacramento to the Big Bend of Truekee.
5th. It forms a local road for the counties of Sacramento, Placer and Nevada.
6th. It commands and will perform the entire business of Nevada Territory, Washoe, and the Silver mineral region.
7th. It will also command the business of the newly discovered Humboldt mineral district, Pyramid Lake, Esmeralda, and Mono mineral districts.
8th. It crosses the Truekee Meadows at the head of Steamboat Valley, which, with Washoe Valley and Eagle Valley, connects with Carson Valley, enabling a branch road, with light grades, to be built to any point on Carson River.
9th. It reaches eastern base of Sierra Nevada in 11½ miles from Summit.
10th. It follows the valley of Truekee River, without obstacle, to Big Bend, or Humboldt Desert.
11th. It entirely avoids the second summit of Sierra Nevada.
12th. Its maximum grades are 105 feet per mile, or less than those of the Baltimore and Ohio Railroads.
13th. The grades down the Truekee will not exceed 40 feet per mile.
14th. The elevation of line is maintained, continuously to the summit—there being no down grade running easterly to Summit.
15th. An uniformly descending grade is maintained from the summit easterly to the Truekee, or eastern base.
16th. Encounters no elevated plateau of table-land at Summit.
17th. Running to and from summit with maximum grades, cannot have an extensive snow-line.
18th. Runs through extensive forests of Pitch and Sugar Pine, Fir, Cedar, and Tamarac, which latter two species of timber are abundant, and will furnish excellent cross-ties.
19th. Crosses no deep river canons or gorges.
20th. Its longest tunnel will not exceed 1,350 feet in length, and no shafting will be required.
21st. Shortest radius of curvature, 573 feet.
22d. Navigable waters of the Sacramento River at all seasons of the year its western terminus; Washoe and the Great Basin its eastern terminus.

23d. At Big Bend of Truckee, the line is in position to procced *via* the Humboldt to Salt Lake, or follow the Simpson route to some point.

24th. *Saving in distance* over route *via* Madelin Pass and headwaters of Sacramento, as surveyed by Lieut. BECKWITH, from Lasseur's Meadows, or Humboldt crossing, 184 miles.

25th. Saving in cost of Pacific Railroad line, taking Lieut. BECKWITH's estimate from Lasseur's Meadows, or Humboldt crossing, as compared with cost of present proposed line, in thirteen and one half millions of dollars.

26th. Reduces the time of passenger transit to and from Washoe to 8½ hours. Passengers leaving Virginia station at 5 A. M., will reach San Francisco the same evening.

27th. Saving in cost of transportation of freight to citizens of Washoe or Nevada Territory, one million of dollars per year.

28th. Affords a market for low-class silver ores (now thrown aside), for shipment to Europe, from over 3,000 mining claims.

29th. Is advantageously located for an extension to Oregon.

30th. Completes first western link of Pacific Railroad, overcoming its greatest difficulties.

GENERAL REMARKS CONCERNING LOCATION AND DESCRIPTION OF RIDGE OR DIVIDE.

This divide is the strip of land lying between the American River and its North Fork (on the south), and Bear River and the South Yuba (on the north).

The American River unites with the Sacramento River at the city of Sacramento; Bear River unites with Feather River (a tributary of the Sacramento) about 30 miles north of the city of Sacramento.

The direction of divide is north-easterly and south-westerly. Its width opposite Sacramento is about 30 miles.

The foot-hills of Sierra Nevada begin at Folsom, on the American, and at Johnson's Ranch on Bear River; the line of foot-hills running through or near Lincoln (about 15 miles northerly, from Folsom, and 10 miles, southerly, from Johnson's Ranch), forming a piece of land in Sacramento Valley, between the foot-hills and Sac-

ramento River, of about 30 miles in length and 20 in width. The ravine of Bear River, from Johnson's Ranch to English Bridge (a distance of about 15 miles), pursues nearly an easterly course, while the course of the ravine of American River, from Folsom, is nearly north, to a point within about 8 miles (south-easterly), from English Bridge. Here the American River branches, and the ravine of its north fork, as well as that of Bear River, pursue a north-easterly course, but gradually approach each other to a point about four miles above Illinoistown, called Long Ravine, where the two rivers are less than three miles apart.

At this point occurs the greatest depression on the ridge, and the greatest difficulties in location were found.

From Long Ravine, the ravines of these rivers diverge somewhat, but are scarcely further than six miles apart at any point—the ravine of North Fork and its tributaries and branches continuing up to the summit.

Numerous branches and ravines extend northerly from the North Fork, rendering a location on that side extremely difficult, if indeed practicable, our line at Long Ravine being about 1,200 feet above the bed of North Fork. The ravine of Bear River extends up about fourteen miles above Dutch Flat, widening out near the source of Bear River into a beautiful valley, called Bear Valley, about two miles long and one mile wide. Diminished in size to a small creek, Bear River passes through this valley, and a mile above, is lost among the benches to the right. The ridge between Bear Valley and North Fork of American is about 800 feet high.

Here occurs a singular freak of nature. The South Yuba, augmented by numerous large branches along its course, is seen emerging from impassable rocky canons, and sweeping down through the head of Bear Valley, it turns suddenly to the north and pierces the ridge or divide lying north of Bear Valley, forcing its way out to the northward, between rocky walls, surmounted by peaks from 2,000 to the 3,000 feet high.

There is little doubt, that at some former period, the waters of South Yuba flowed through Bear Valley, and down the ravine of Bear River; and, indeed, it would be no difficult matter, to turn the whole volume of South Yuba into Bear River at the present time.

The South Yuba Canal Company, who supply the Nevada divide with water for mining purposes, take their water from the South

Yuba, at the head of Bear Valley, bringing it down through Bear Valley by the side of Bear River, with a grade of about ten feet per mile, being, at points, as near as 200 feet to Bear River, and not over fifteen or twenty feet above it. Thus, it will be seen, that the canon of Bear River becomes, and is the same as that of the South Yuba, which latter river now takes its place, the divide or ridge being now bounded by North Fork of American on the south, and South Yuba on the north.

The ravine or valley of South Yuba continues on to the summit of Sierra Nevada, and in Summit Valley, within two miles of Summit, the river is a larger stream than is Bear River in Bear Valley.

A barometrical examination of this route indicated that the top of ridge or divide could be reached at Clipper Gap, near the head of Dry Creek, 48½ miles from Sacramento. From this point to Reservoir Gap (about 1½ miles above Dutch Flat, and 25 miles from Clipper Gap), it was found that the line must be carried on the top of ridge.

The line of top or crest of ridge being far from uniform, of course the lowest points or gaps in ridge become commanding points, and it was found necessary to carry the line from gap to gap, passing around the intervening hills, upon their side slopes.

It was also found, upon reaching New England Gap (near the New England Mills, about six miles from Clipper Gap), that to Long Ravine, a distance of eight miles, the ridge was nearly level, the elevation of a grade at Long Ravine being only about 100 feet higher than at New England Gap.

Also that the ridge rose rapidly from Long Ravine, eastward to the next gap (called Secret Ravine Gap).

It was also found that from Reservoir Gap (1½ miles above Dutch Flat) the ridge rose too rapidly for one maximum grade, and that for the next 20 miles, to the bottom or valley of Yuba, the line must be carried on the main slope of Bear and Yuba Rivers. It was thought, however, that the line could be carried up Canon Creek (a tributary of North Fork, with tolerably smooth side slopes), to Dutchman's Gap, about eight miles above, and there cutting through the gaps, brought out on to Bear River side-hill.

Subsequent examination proved this to be impracticable. Canon Creek rising too rapidly for our grades, we were therefore compelled to carry the line immediately on to Bear River side-hill, and

were fortunate enough to be able to avail ourselves of the side-hill of Little Bear River for that purpose.

Being on the top of ridge at Reservoir Gap, we were enabled to cross Little Bear River near its head, and to use its side-hill for an approach to Main Bear River.

The barometrical elevations also indicated that the Yuba could be reached about twenty miles above Dutch Flat, at the head of its canons, and the line carried along up its smooth, uniform bottoms for some distance; then, by taking to its south side-hill, Summit Valley and summit reached with maximum grades.

The South Yuba, from this point (twenty miles above Dutch Flat), called Yuba Bottom, extends to the summit, a distance of sixteen miles, most of the way through a valley, in some places 500 or 600 feet wide. The old Truckee emigrant trail follows down through the valley a portion of this distance, generally over a smooth natural road.

Were the fall of this river evenly distributed, it would afford a uniform grade of a little less than 100 feet per mile to the summit.

Rising, however, from Yuba Bottom (say half a mile at a grade of fifty feet per mile), the river canons for half a mile at a steeper grade; thence for four miles its grade is about sixty feet per mile; it then canons, rising about 250 feet in a mile, at a point called Slippery Rock Canon.

The river then rises gently for about three miles, and again rapidly for three miles, to Summit valley.

Through Summit Valley (a distance of two and a half miles) its grade is scarcely twenty-five feet per mile, then rises rapidly again to the summit.

Inasmuch as the indications of altitude of the aneroid barometer proved lower than those of the true level, after continuing our line for six miles along the Yuba bottom, we were obliged to retrace our steps and commence again near Yuba Bottom, running up on south side-hill of Yuba, with maximum grade, into Summit Valley, in order to attain a sufficient elevation to reach the summit.

Summit Valley is a beautiful valley, near the source of the Yuba, about two and a half miles long and three-quarters of a mile wide, yielding excellent pasturage for cattle, hundreds of which are driven there each summer.

From the summit looking easterly, you appear standing upon a nearly perpendicular rocky wall, of 1,000 feet in hight.

Immediately below is seen a valley, from one to two miles wide, extending up from the Truckee River, to nearly beneath your feet. Donner Lake, (about three and a half miles long, by one mile in width) occupies the upper portion of this valley, and its outlet is seen pursuing its course down to a junction with the Truckee. Two long ranges or spurs are seen, on either side, parallel with and inclosing the lake, reaching from the summit to Truckee River. Immediately beyond the river is seen the second summit of Sierra Nevada, while still further in the distance the Washoe Mountains are plainly visible.

Passing the summit, our line is carried down upon the side-hill of the range, on the south side of Donner Lake, descending with the maximum grade for about eleven miles.

The distance, in a direct line, from Summit to Truckee River, does not exceed eight miles: but we fortunately encountered two long ravines, with smooth side-slopes, which, with the sinuosities of side-hill, gave about three additional miles of distance, enabling us to reach the Truckee with maximum descending grades.

PARTICULAR DESCRIPTION OF LINE.

Commencing at the city of Sacramento, the line will cross the American River about half a mile above Lisle's Bridge; thence pursuing a north-easterly course, for twenty-five miles, across the Sacramento Valley, it reaches the town of Lincoln, or intersection with the California Central Railroad, which point is at an elevation of 140 feet above the top of the levee at Sacramento.

From Lincoln the line follows up an indentation or bay, in the foot-hills, with grades not exceeding 50 feet per mile (passing half a mile north of Virginia), to Barmore's, thirty-one miles from Sacramento (elevation, 340 feet above Sacramento), from which point grades of 84 feet per mile are first used.

Continuing on up the southerly bank of Doty's Ravine (passing about one mile north of Gold Hill), the line crosses Doty's Ravine, running down the north side of same for about one-quarter of a mile with ascending grades; thence, turning to the right, it crosses the traveled road, near Dutch Colonel's House, and passes up the upper portion of what is known as Shipley Ravine.

Thence crossing north-easterly corner of the old Boyen Ranch,

it follows northerly (near the line of what is known as Sailor's Ravine Ditch), at the base of the foot-hills, to Sailor's Ravine.

Running up Sailor's Ravine, about one-third of a mile, the line crosses the same, and, turning to the left, it passes about 300 feet east of Moore's House; continuing on, up a branch of Sailor's Ravine, to a point called Bar Summit, having attained an elevation of 660 feet above Sacramento.

Thence winding about between the heads of small ravines, it crosses near the head of Taylor's and Sedergest Ravines, and passing about two-thirds of a mile north of Taylor's House, reaches the side-hill of Dry Creek.

Passing up the south-side-hill of Dry Creek, the line follows up two tributary ravines a short distance, to a favorable crossing, and in a short distance further strikes another tributary, called Deadman's Ravine.

This ravine, presenting a smooth side-hill, the line continues up the same about half a mile, to a favorable point, where it crosses, at a hight of about 45 feet.

Pursuing its course down the east side-hill of Deadman's Ravine, it strikes again the main side-hill of Dry Creek, following the same to the point where it breaks from its smooth, uniform valley, into rocky canons; thence up Dry Creek about two and a half miles, to the Auburn and Nevada Stage Road.

From the Nevada Stage Road to Clipper Gap (a distance of six miles), the line follows up the valley of Dry Creek, with grades varying from 50 feet to 105 feet per mile. (At one point on the profile, a grade of 116 feet per mile will be observed. This is the grade upon the line, as run; but a slight alteration of line will reduce it to 105 feet.

From point where Dry Creek canons to Clipper Gap, the line passes up and near to Oert's House, Page's, Redwines, passing under the flume of Bear River Ditch, and crossing Wyman's Turnpike and Auburn and Nevada Stage Road at Hawes' Store.

Thence passing over lands and near the dwellings of Wells, Gilbert, Cook, Kingsley, Cogswell, Watson, Buckley, and Neil, it reaches Gasorway's, or Golden Gate Hotel (passing about 25 feet in front of Gasorway's house).

Here the stage road forks, one branch following up a side ravine to the left, over Tunnel Hill, and *via* Empire Mills to Illinoistown,

while our line continues to the right, up Dry Creek, about a mile further, passing about 200 feet in front of Predmore's house.

Here, instead of following Dry Creek further (it rising too rapidly for our grades), we cross a gap to the right, called Clipper Gap, and run up the north side-hill of Clipper Ravine, (a tributary of North Fork of American), to Wild Cat Summit, crossing several short, steep side ravines.

Passing through Wild Cat Summit (about one-quarter of a mile south of Widow Hawes' house), we pass around Hawes' Hill, and curving to the left, cross the main road, and pass up a smooth ravine to the top of the ridge, at a point called Applegate Summit.

A short distance further on, the line passes through Evergreen Gap, crossing the divide again at Baney's Gap, from which point it curves round on side-hill (on North Fork side) to Star House Gap, near the Star House.

Here the line crosses Star House Gap (and the traveled road) about 50 feet high, passing up very nearly on top of divide, to the head of Applegate Ravine, which runs into Bear River, this point being called New England Gap.

From New England Gap the line passes out upon north side-hill of North Fork.

Crossing the traveled or Stage Road, it runs along above the same, and about 500 feet above New England Mills, through peach orchard of Murphy; through Manzanita and Chaparral Gaps, and over Sugar Loaf Summit to Lower Illinoistown Gap, at the point where upper stage road crosses the gap (about one and a quarter miles below Illinoistown.)

Crossing this gap, about 30 feet high, the line continues on about half a mile further, over a broken country, to a point called Bear River Gap, where it turns abruptly to the left, with maximum curve, and crosses the ridge with a tunnel of 500 feet in length, emerging on the south side-hill of Bear River, along which it pursues its course to Storm's Gap and Long Ravine Gap, leaving Illinoistown about one mile to the right.

Here was found the greatest difficulty in location; Long Ravine Gap being an unusually low depression, the ridge beyond rising quite rapidly to attain its average elevation.

Here the line crosses gap, about 70 feet high, and curving to the right, follows the side-hill of Rice's Ravine (leading to North Fork) for about one mile, encountering a succession of short, steep,

abrupt side ravines, to Cape Horn, which is a bold, rocky bluff, nearly perpendicular, and 1,200 feet high, above the North Fork of American.

Passing round the face of this bluff, about 200 feet below the table above, we strike the side-hill of Robber's Ravine, which runs parallel to Rice's Ravine, and continues up along the side-hill of same for about one and a half miles, crossing Oak Summit, and passing about three-quarters south of Madden's Toll House, through Trail Summit.

From this point the line follows along the face of side-hill above North Fork, striking Secret Ravine, along which it runs for about one mile, when, turning to the left, it passes up a tributary side ravine to its head, the line striking a point about two hundred feet south of stage road, one mile south of Secret-town.

Running thence, along side of road nearly a mile, it crosses the same, and passing between Everhart's house and barn, at Secret-town, it reaches the head of Secret ravine, or Secret-town Gap, crossing it with trestling, about 50 feet in hight.

Turning to the left, the line now passes north of Cold Spring Mountain (on Bear River side), and for two miles encounters a succession of steep side ravines, where some of the heaviest work on the line will be found. Two tunnels will be necessary on this piece of line, each about 600 feet in length.

Leaving the side-hill again, the line strikes a long and nearly level bench, about two miles in length, extending up nearly to Dutch Flat.

This bench is the well known gravel ridge which extends along the slopes of the Sierras at about this elevation, and on which are situated the mines worked by the hydraulic mining process.

Extending up this ridge to within about one mile of Dutch Flat, the line again takes to side-hill to left, running near to Strong's Cabin, Brickell's Steam Saw Mill, Dutch Flat Steam Saw Mill, to the Dutch Flat Water Company's large reservoir (about one and a half miles above Dutch Flat).

The town of Dutch Flat lies on Bear River side-hill, about half way down to Bear River, the line passing about half a mile in the rear, and about 300 feet higher than the town.

At this last named reservoir, which is upon the top of ridge (called Reservoir Gap), we leave the crest of ridge for the last time,

it rising too rapidly to be available for a railroad line at our maximum grades.

Turning to the left, the line now runs at nearly a level grade, about one and a half miles further to Little Bear River, which stream it crosses just above the Saw Mill, near Widow Homer's Ranch.

Pursuing its course down the north side-hill of Little Bear River, it departs at Ellmore Hill, passing round the same, and enters upon the side-hill of Bear River.

The river gorge at this point is about 1,500 feet deep—our line being about 500 feet below the top of ridge, and from 1,000 to 1,200 feet above the river. Its side-hill is steep, rocky, and marked by many abrupt indentations and corresponding salient points.

The line was carried *round* most of these points; but upon a final location, it will probably be found advisable to run through the sharp points with short tunnels—the longest of which will be 1,350 feet—none of them, however, requiring shafting.

The line passes up this side-hill of Bear River (the grade line being nearly parallel with the crest or top of the ridge, and from 500 to 700 feet below the same), crossing through Zerr's Ranch (about 600 feet north of his buildings), striking the lower end of Bear Valley, about 200 feet high, on its south side-hill.

Continuing on for two miles, it leaves the head of Bear Valley, at an elevatien of about 350 feet on side-hill above the same, crossing the head of Bear River (which is here but a small creek), following it up to its source, which is in a marshy lake, about one and a half miles above Bear Valley.

It will be observed on the profile, that from Zerr's Ranch to head of Bear River a grade line is indicated, running about 100 feet higher on the side-hill.

In locating the line as run, the intention was to cross Bear River, and continue on the side-hill of the main gorge to Yuba River (near head of South Yuba Water Company's Canal), keeping up on main side-hill of South Yuba to Yuba Bottom; but upon examination, this proved to be impracticable, the Yuba above Bear Valley running in deep rocky canons, with perpendicular rocky walls of granite, too rugged in their character to admit of the location of a line over them.

It therefore became necessary to carry the line on to a bench above and south of the Yuba River, and nearly at the base of main

Ridge—a line from Zerr's Ranch to this point being practicable at our maximum grade, the only change necessary being to make the location a little higher on side-hill.

Our present line passes about 100 feet to the left of Jew Davids' Cabin. On the location as changed, it will pass a short distance in the rear of same.

Continuing on, the line pursues the general course of Yuba River, about six miles further, to the point where old Truckee emigrant trail leaves Yuba Bottom to ascend on the main ridge to the south (which point is 19 miles above Dutch Flat by trail, and about 22½ miles by our line), called Yuba Bottom.

This point is at the head of the lower canons and falls, between Yuba Bottom and Bear Valley.

In subsequent location, it will be necessary to run the line between these two points, (viz., head of Bear River to Yuba Bottom) a little lower down on side-hill, as indicated on profile, for the following reasons: Fearing that the elevation of Yuba Bottom might prove too high, the line was run from head of Bear River, at our maximum grade, in order to gain as much elevation as possible. But on reaching Yuba Bottom, it was found that this gave more elevation than was necessary; therefore the last half mile of line was run down on to Yuba Bottom. The last elevations show, that a grade of 80 feet per mile can be obtained from the head of Bear River to Yuba Bottom.

From this point (Yuba Bottom), the line follows the river for about one mile, passing through a short canon, and emerging at very near the level of water surface in river (called Hall's Canon.)

From this point the line was first run for about six miles up the river valley, taking to side-hill at the two upper canons, the line being carried up to the upper ford, at head of Wilson's Cut-Off; but finding that the summit could not be reached without increasing grade on the remaining distance, our parties proceeded to summit, from which a line was run down on south side-hill of Yuba, at maximum grade, striking into the valley line, at head of first small canon (about one mile above Yuba Bottom), called Hall's Canon.

The location, therefore is carried from Hall's Canon, on South side-hill of Yuba, at maximum grades, into lower end of Summit Valley (about 3½ miles below summit of Sierras), crossing the old Truckee Emigrant Trail, near Kidd's Reservoir, about half way up to the top of ridge, the line striking the lower end of Summit Val-

ley, about the level of Yuba River; running thence straight across Summit Valley, about two miles, at a grade of about 25 feet per mile, to a point on the south side of Summit Valley, near Cook's old cabin, the line takes to side-hill on the right, and in 1½ mile further reaches the summit of Sierras, with a cutting of about fifty feet.

By commencing the last named ascent a little further back in Summit Valley, the summit can be reached with maximum grades without any excavation. The elevation of surface at summit is 7,027 feet above top of levee at Sacramento.

DESCENT ON EASTERN SIDE OF SIERRA NEVADA.

Pursuing its course from the summit easterly, the line commences its descent with maximum grade, and, passing to the right, is carried for next two miles over a steep, rocky side-hill, on which will be found quite heavy rock cutting: thence turning abruptly to the right, it enters upon side-hill of Strong's Ravine, and, running up the same, about one mile, crosses over, and is carried down over a smooth side-hill, to a point 600 feet higher than the south-west corner of Donner Lake, thence pursuing its course along the side-hill for about three miles, it encounters Coldstream Ravine, and runs up the same a little over a mile.

Crossing Coldstream, the line follows along down its south side-hill to within about a quarter of a mile of the Main Truckee, where turning to left, it crosses the valley of Donner Creek, accomplishing the descent in about 11½ miles of downward maximum grade. Thence the line was carried about five miles down the valley of Truckee River, and the survey terminated at a point 128 miles from Sacramento.

The object of this survey being to accomplish the crossing of the Sierras with a Railroad line, it was considered unnecessary, at this time, to extend the survey any further down the Truckee River; barometrical elevations were taken from our line up the Truckee River to Lake Bigler, and also down the same to the lower end of Truckee Meadows, showing its average fall to be only about 35 feet per mile.

I also carried a series of observations down Steamboat Valley to Steamboat Springs, thence across the Washoe Mountains (*via* Virginia, Flowery and Six Mile Canon) to the Carson River, thence

down the same to Fort Churchill—a profile of which is shown on the small, general profile of grades.

A continuation of our line down the Truckee to Big Bend follows the same, from terminus of survey, 13 miles, to Neil's Ranch, or Henness Road; thence 7 miles to Stout's crossing of Truckee; thence through the Truckee Meadows and across head of Steamboat Valley eight miles to Stone's crossing or Western base of Washoe Mountains; thence 23 miles, through Washoe Mountains, to Big Bend of Truckee, or edge of Humboldt Desert, making the total distance about 178 miles.

No obstacle exists, and a line, with light grades over exceedingly smooth surface, can be carried from Stout's crossing of Truckee, up Steamboat Valley, to its head; thence through Washoe Valley into Eagle Valley, which opens into Carson Valley; thence down the Carson River to Fort Churchill, or edge of Desert, making, however, a longer line than that down Truckee.

GRADES.

The following table of grades extends from Lincoln (25 miles from Sacramento, and six miles from westerly base) to terminus of survey (or four miles beyond eastern base of mountains), or includes 11 miles beyond base of mountains. The average grade from Sacramento to Lincoln (25 miles) being six feet per mile.

TABLE OF GRADES.

LENGTH OF PLANE, FEET.	GRADE ASCENDS PER MILE.	GRADE DESCEND PER MILE	LENGTH OF PLANE, FEET	GRADE ASCENDS PER MILE.	GRADE DESCEND PER MILE.	LENGTH OF PLANE, FEET	GRADE ASCENDS PER MILE.	GRADE DESCENDS PER MILE.
3,000	9	.....	4,000	53	.....	500	Level	.....
3,000	53	.....	6,750	105	.....	5,000	79	.....
1,000	Level	.....	18,250	Level	.....	3,000	105	.....
3,000	45	.....	3,000	105	.....	3,000	79	....
4,500	Level	.....	1,000	Level	.....	38,000	105	.....
6,500	45	.....	6,000	36	.....	2,000	Level	.....
4,000	36	.....	13,500	Level	.....	1,000	53	.....
4,300	53	.....	17,500	105	.....	25,000	79	... .
6,300	79	.....	1,000	Level	.....	2,750	26	.....
3,200	Level	.....	3,500	105	.....	3,500	105	.....
500	53	.....	1,000	Level	.....	2,000	Level	.....
12,700	84	.....	3,500	105	.....	57,500	105	.....
3,300	Level	.....	1,000	53	.....	1,750	53	.....
5,000	84	.....	2,500	105	.....	2,500	Level	.....
6,000	65	.....	2,000	Level	.....	13,750	105	Summit
7,100	84	.....	13,000	105	.....	45,000	.....	105
1,300	53	.....	1,000	Level	.....	1,750	.....	Level
2,500	105	.....	1,000	53	.....	15,250	.....	105
1,800	26	.....	4,000	Level	.....	2,500	.....	Level
17,250	75	.....	17,000	105	.....	6,500	.....	53
1,000	53	.....	1,250	Level	.....	3,200	.....	39
1,000	75	.....	1,000	79	.....	2,750	.....	Level
1,700	105	.....	1,000	Level	.....	3,500	.....	39
2,500	75	.....	4,000	53	.....	1,000	.....	53
2,000	105	.....	14,000	105	.....	2,000	.....	39
2,000	65	.....	3,000	53	.....	.....	.....	... .
3,000	105	.....	4,000	79	.....	.....	.....	....
15,000	116	.....	10,500	105	.....	.....	.....	.....
11,000	105	.....	1,000	53	.....	.....	.....	.....

SUMMARY OF GRADES.

	GRADE. FEET PER MILE.	MILES ASCENDING.	MILES DESCENDING.
	9	0.56	
	26	0.86	
	36	1.89	
	39		1.04
	45	1.80	
	53	5.08	1.42
	65	1.53	
	75	1.38	
	79	8.39	
	84	8.03	
	105	43.08	11.41
	116	2.84	
	Level	11.19	1.33
Total distance Lincoln to Summit		87.63	15.20

From which it appears that upon the western slope:

No. of miles of Ascending grade 116 ft. per mile } ...2.84 miles.
No. of miles of Ascending grade 105 ft. per mile } ..43.08 "
No. of miles of Ascending Grade 84 ft. per mile.....8.03 "
No. of miles of Ascending Grade 79.75 ft. per mile...9.77 "
No. of miles of Ascending Grade 65 ft. per mile.....1.53 "
No. of miles of Ascending Grade 53 ft. per mile.....5.08 "
No. of miles of Level.....11.19 "

While upon the eastern side, or descent, there are 11.41 miles of grade, of 105 ft. per mile.

The total elevation of grade overcome at Summit is 7,000 feet.

That the elevation overcome in crossing the summit of Sierra Nevada is greater than that upon any other line of road in the United States, is true. But it is no less true that the grades employed in reaching the summit, are less than the maximum grade employed on important roads in the United States; the Pennsylvania Central having ten miles of grade of 95 feet per mile, while the Baltimore and Ohio Railroad has one plane, 15 miles in length, on which are 11½ continuous miles of grade of 116 feet per mile, and 3½ of 100 feet per mile. A portion of the Virginia Central Railroad was operated successfully a period of five years over two

miles of grades of 300 feet per mile, with curves of 300, and one as small as 238 feet radius—with a 30-ton locomotive engine.

By referring to the above table of grades, it will be seen that the longest piece of continuously ascending maximum grade of 105 feet per mile, is about 10 miles; all of these heavy grades being relieved at frequent intervals by lesser grades or levels. So that on no portion of the road will there be so long a piece of continuously ascending grade of 105 feet per mile, as upon the 116 feet grades of the Baltimore and Ohio Railroad.

It is deemed unnecessary, here, to enter upon a calculation of the effective power of locomotive engines upon different gradients, General McClellan having given very full notes of the results of his investigations upon the subject, in his memoranda on P. R. R., published in the Report of the Secretary of War upon P. R. R. Surveys. The following extracts from his Report are given here:

"On the Pennsylvania Central Road, are gradients of 95 feet per mile, for 9¾ miles. Passenger trains ascend this grade with a velocity of 24 miles per hour, and descend at 20 per hour.

"The working load of the heavy freight engines (weighing 65,000 lbs., on eight drivers), on the 95 feet gradient, is 125 tons net, or about 208 tons, including tender and cars."

Of the Baltimore and Ohio Railroad, he says:

"The most interresting and analogous case, however, to which I can refer, is that of the Baltimore and Ohio Railroad, one of the great lines in the United States, alluded to in a previous part of this article, as connecting the seaboard with the valley of the Mississippi across the Alleghany Mountains. In the year 1850. 447,000 tons of merchandise and 180,000 passengers were transported on this Road, the receipts amounting to $1,343,000, the road being only about half completed. When finished to the Ohio river, the receipts are expected to amount to $3,000,000. On this road are heavy gradients, with several curves of 600 feet radius, and some of four hundred feet. It is to the monntain district of the road just opened, that I wish particularly to invite attention, and for this purpose an extract is made from the official report of the Chief Engineer, Mr. Latrobe, one of the most distinguished engineers of North America, in which he describes the route and grades over the Alleghany Mountains."

"At about a mile below this point, the *high grade of* 116 *feet per mile begins and continues about* 11½ *miles*, crossing the Potomac from Virginia into Maryland near the beginning of the grade, and thence ascending the steep side slopes of Savage river and Crab Tree Creek, to the summit, at the head of the latter, a total distance of about 15 miles. Upon the last three and a half miles of which, the grade is reduced to about 100 feet per mile. From the summit, the line passes for about 19 miles through the level and beautiful tract of country, so well known as the Glades, and near their western border the route crosses the Maryland boundary, at a point about sixty miles from Cumberland, and passes into the State of Virginia, in whose territory it continues thence to the terminus on the Ohio. From the Glades, the line *descends by a grade of* 116 *feet per mile, for eight and a half miles*, and over very rugged ground, and thence three and a half miles further to Cheat River, which it crosses at the mouth of Salt Lick Creek. The route, immediately after crossing this river, ascends along the broken slopes of

the Laurel Hill, by a *grade of* 105 *feet per mile for five miles*, to the next summit, passing the dividing ridge by a tunnel of 4,100 feet in length; and whence, after three miles of light grade, a descent by the *grade of* 105 *feet per mile for five miles* is made to the Valley of Raccoon Creek, by which and the Valley of the Three Forks Creek, the Tygarts Valley River is reached in fourteen miles more, at the Turnpike Bridge above described, and 103½ miles from Cumberland."

Upon the Virginia Central Railroad, the Alleghany Mountains were crossed with grades of 296 feet per mile, and the road operated successfully a peried of over five years.

Reference is had to a pamphlet published by CHAS. ELLET, Esq., the Engineer of the road, who says:

EASTERN SIDE.

"The length of descent, from summit to foot of grade, on eastern side, is 2 37-100 miles.

"The road descends in this distance 610 feet.

"The average grade is, therefore, 257 feet per mile.

"The maximum grade is 296 feet per mile.

WESTERN SIDE.

"Length of descent 2 2-100 miles.

"Road descent in this distance 450 feet.

"Average grade is 223 feet per mile.

"Maximum grade is 280 feet per mile.

"On both sides of mountains, the ruling curves are described with a radius of 300 feet, on which the grade is 237 feet per mile."

"The admirable engines relied on to perform the extraordinary duties imposed upon them in the passage of this summit have failed *but once* in this period—2½ years—to make their regular trips. The mountain has been covered with deep snow for many weeks in succession, and the cuts have been filled, for long periods, many feet in depth, with drifted snow; the ground has been covered with sleet and ice, and every impediment due to bad weather and inclement seasons has been encountered, and successfully surmounted in working the tracks.

"The total weight of engines is 55,000 lbs., or 27½ tons, when the boiler and tank are supplied with fuel and water enough for a trip of eight miles."

"Ascending engines stop daily on a grade of 280 feet per mile, and are there held by the brakes, while the tanks are being filled, and are started again, at the signal, without difficulty."

With the practical experience afforded by the workings of these roads, it may be safely assumed, that a thirty-ton engine, with eight drivers, will ascend the maximum grades of this road with an ordinary passenger train at a speed of twenty miles per hour.

That an engine of the same class will ascend these grades, with a freight train weighing 150 tons, at a speed of 13 miles per hour.

The following is taken from memoranda of Gen. MCCLELLAN on subject of Pacific Railroad:

Calculations for a 30-ton Engine on 6 drivers, total adhesive weight..67,200 pounds.
By formula 1, maximum load on a level is ..... 1,680 tons.
By formula 2, maximum grade up which this engine can draw a load of 76 tons is..... 401 feet.
By formula 4, the maximum grade for same load is..... 281 feet.
By formula 1, the maximum load for grade of 150 feet is..... 186 tons.
By formula 3, the maximum load for same grade is..... 133½ tons.
By formula 1, the maximum load for grade of 200 feet is ..... 146 tons.
By formula 3, the maximum load for same grade is..... 104½ tons.

COMPARISON OF ELEVATIONS OVERCOME.

Route.	Length. Miles.	Summit Elevation. Feet.	Total Rise and Fall. Feet.	Max. Grade. Feet.
Boston route	500	1,440	4,700	83
N. Y. Central	400	650	2,100	30
N. Y. and Erie	460	1,720	6,500	70
Philadelphia route	340	2,400	5,600	95
Baltimore route	390	2,700	7,000	116
Charleston route	490	1,400	5,000	40
Savannah route	440	1,400	5,000	40
Santiago	110	2,640	4,340	119
Central Pacific	140	7,000	8,800	105

It will thus be seen, that the sum of ascents and descents upon this line are but 1,800 feet more than upon the Baltimore and Ohio Railroad, our line crossing a summit of 7,000 feet, the elevation of summit on that road being only 2,700 feet.

The small per centage of total rise and fall upon this line, as compared with the altitude of summit, is due to the fact that there are no undulatory grades—the rise and fall is constant, no elevation being lost.

GRADES ON LIEUT. BECKWITH'S ROUTE FROM LASSENS TO SALT LAKE, 451 MILES.

The following in a statement of grades from Lassens to Salt Lake, taken from Lieut. Beckwith's Profile, assuming his projected improvements in location:

	Miles.	Ascending Grade, Feet Per Mile.	Descending Grade. Feet Per Mile.
Lassen's to Junction Main Forks of Humboldt	145	4	
Junction Forks to Creek	35	31	
To stream near Summit	8	89	
To summit Humboldt Mountains	1	25	
Summit to mountain stream	3		25
To Camp 16	8		58
To Camp 15	15	4	
To Camp 14	28	7	
To Camp 13	10		21
To Camp 12	20	Level.	
To Camp 10, Fish Creek	28		21
To Point on Fish Creek	16	Level.	
To Camp 8, Granite Mountains	40		10
To Camp 6	24	0½	
To Camp 5	15		12
To shore of Salt Lake	21		10
To Camp 3	13	18	
To Oquirrh Mountains, or opposite Salt Lake City	21	8	
	451		

The highest grade shown being 8 miles of 89 feet grade, which can probably be reduced to 50 or 60 feet per mile.

ALIGNMENT.

The first 25 miles of line from Sacramento to Lincoln will be generally straight. From Lincoln to Barmore's, or six miles further, the least radius of curvature will be 1,432 feet.

From Barmore's (or western base) to the Truckee River, or eastern base of Sierra Nevada, the line is mostly on side hill; there is, consequently, a preponderance of curved line rendered necessary by the sinuosities of side hill and projecting points.

The least radius of curvature, however, upon the line is 573 feet, or a ten-degree curve.

The Baltimore and Ohio Railroad has several curves of 600 and some of 400 feet radius. (See Report of General McClellan.)

The Virginia Central Railroad had curves of 300 feet radius, on which the grade was 237 feet per mile. One curve upon that Road had a radius of 238 feet. (See Report of Chas. Ellett, Esq.)

Curves of 500 feet radius are common upon many of our Eastern roads, and are safely traversed at a speed of 30 miles per hour.

For a particular description of the alignment of this road, atten-

tion is invited to the large map of location (scale 400 feet per inch) exhibiting each curve and tangent, with the length and radius marked upon it.

Also, to the tabular arrangement of the same, in which each curve and tangent is laid down, from which it will be seen that between Barmore's and Truckee River, a distance of 92 miles, there is of straight line:

No. of Curves of 573 feet radius	157
No. of Curves of 716 feet radius	65
No. of Curves of 955 feet radius	140
No. of Curves of 1,432 feet radius	65
No. of Curves of 1,910 feet radius	62
No. of Curves of 2,865 feet radius	23

From the eastern base of mountains to Big Bend of Truckee, the length of curved line will not exceed thirty per cent. of the whole distance, the curves being generally of over 1,500 feet radius.

Thus, it will be seen that the alignment of this road compares favorably with that of many of the most important roads of the Atlantic States.

SNOWS.

The argument of obstruction from snow having been frequently urged against the Central route for Pacific Railroad, I have taken much pains to arrive at correct conclusions upon this subject, and feel warranted in the statement, *that a Railroad Line, upon this route, can be kept open during the entire year* for the transaction of its business.

It is true that snow falls to a greater depth upon the elevated portions of this line than upon the lines of Railroads in the Atlantic States.

The depth at which snow lies upon this route is plainly distinguishable at any season.

The trees are generally covered with moss down to the level of the snow, and thousands of them can be seen entirely free from moss up to a certain hight, and almost entirely covered with moss from that hight.

Frequent marks have also been made by persons who have traversed the route on snow shoes, during the winter, by axe marks chopped in the tree at the level of the snow.

The limbs of the small trees also afford indications of the hight of snow; those limbs lying beneath the snow maintaining their original or natural position, while those above the snow-line are almost universally bent downwards, and not unfrequently broken by the weight of snow.

These observations lead to the conclusion that the greatest depth of undisturbed snow is 13 feet at the summit.

In places where drifts occur, the depth is of course greater, and at corresponding points, less than the average level.

This may, at first, seem to be a serious obstacle to the passage of Railroad Trains. But this depth of 13 feet is not the result of a single storm, but the *accumulation of a number of successive storms, occurring during the winter.*

Snow does not melt very rapidly at this elevation, during the winter.

A storm will occur, and snow fall to the depth, perhaps, of three or four feet.

Another storm will, perhaps, add two or three, or four feet to this depth.

Successive storms add to its depth; but it is believed that its highest level is not over 13 feet.

The town of Dutch Flat, 72 miles from Sacramento, and 40 miles from summit may be considered the foot of snow line on western side—snow seldom falling more than two feet there, and melting off in a day or two.

The average depth of snow at lower end of Donner Lake is about six feet.

At Neil's Ranch, on the Truckee River, 28 miles easterly from the summit, I am assured by Mr. Neil, that the greatest depth of snow last winter was 18 inches, and that during the five years he has lived there, it has not exceeded three feet in depth.

It may be safely concluded that the line of deep snows terminates where our line strike the Truckee River, or, say, 12 miles from the summit, making 52 miles of snow line.

It will also be remembered that our line is almost exclusively a *side-hill line*, from which the snow can be more easily removed than from a level surface.

It is only necessary, then, to start an engine with snow-plows, from the summit each way, at the commencement of a storm, clear-

ing the snow as it falls. A similar course of procedure at each successive storm, will keep the track open during the entire winter.

It is also stated that a crust soon forms upon the snow, which prevents its drifting badly.

The only point where we shall encounter a level surface of snow, is in Summit Valley, for about two miles.

By elevating the track at this point, no trouble need be anticipated.

The great dread, and real danger of a storm in the mountains, does not arise from the depth of snow, but from the entire absence of shelter and relief in the mountains, there being no houses or accommodations, excepting upon the wagon roads across to Washoe.

The Placerville wagon road is kept open for travel during the entire winter, hotels being established every few miles along the route. With a railroad built upon this route, this objection would also be entirely obviated.

TUNNELS.

Upon the line, as located, but four tunnels appear upon the profile, but upon further examination, it has been deemed expedient to cut through several sharp projecting points, instead of carrying the line around them,

It is estimated that the cost of these tunnels will not exceed the cost of the increased length of line around these points.

It will be observed that the tunnels are comparatively short, the longest being 1,370 feet in length; they can all be worked from either end, reducing the greatest consecutive length of tunneling to 685 feet.

They are in rock, generally granite, and require no shafting.

The cost of shafting in long tunnels is usually one-third the whole cost of tunnel.

Their lengths are as follows:

1	500	feet long.	1	1,300	feet long.	1	1,200	feet long.
1	600	"	1	1,370	"	1	1,100	"
1	800	"	1	1,250	"	1	400	"
1	1,200	"	1	1,300	"	1	1,070	"
1	1,000	"	1	1,370	"	1	1,100	"
1	1,100	"	1	300	"	1	450	"
						18	17,410	

Making 18 tunnels, with an aggregate length of 17,410 feet, costing, at $50 per linear foot, $870,500.

The longest tunnel can be excavated in thirteen months, at the rate of two feet per day.

The following statistics were given in report of Gen. McClellan to the Secretary of War, on Pacific Railroad:

Nerthe Tunnel, France—15,153 feet long; 24 shafts; aggregate length of which was 7,589 feet; deepest of which was 610 feet; in very hard limestone; dimensions, 29½ by 26¼ feet.

Its cost was as follows:

For mining body of tunnel	$705,982
For mining shafts	109,081
Masonry for shafts	49,069
Lining for body of tunnel	423,711
Cost of aqueduct	10,607
Total cost of tunnel	$1,298,450

Cost of mining main body of tunnel, $46.58 per linear foot.

Woodhead Tunnel, England—3½ miles long 5 shafts; 400 to 600 feet deep; rock, granite, or mill-stone rock; entire cost, $1,026,705; cost of tunnel, *including shafting*, $55 per linear foot. Excavated at the rate of eight feet per day.

Uppingham Tunnel—1,320 feet long; cost $40 per linear foot.

Black Rock Tunnel, Pennsylvania—1,932 feet long; rock, greywacke; six shafts; cost $77 per linear foot.

The cost per cubic yard of excavating tunnels in the United States, has been:

Lehigh, very hard granite	$4 36	per linear foot.
Schuylkill State	2 00	" "
Union State	2 09	" "
Blue Ridge Tunnel	4 00	" "

A section of tunnel, averaging 20–|–17 feet, contains, 12⅔ cubic yards per linear foot.

TIME CONSUMED IN MAKING THE TRIP WITH PASSENGER TRAINS FROM SACRAMENTO TO VIRGINIA STATION.

	Distance.	Speed per Hour.	Time.
Sacramento to Barmore's	31 miles.	31 miles.	1 hour.
Stoppage at Barmore's			:30
Barmore's Summit	81 miles.	20 miles.	4
Carried forward	112		5:30

	Distance.	Speed per Hour.	Time.
Brought forward.....	112		5:30
Four stoppages, 15 minutes each.....			1
Summit of Truckee River.....	11 miles.	15 miles.	:45
Stoppage			:15
Truckee to Neil's	17 miles.	34 miles.	:30
Neil's to Stone's of Virginia Station..	15 miles.	34 miles.	:30
	155 miles.		
Total time consumed in making trip..... or 8½ hours.			8:30

A train leaving Sacramento at 6 A. M., would arrive at Virginia Station (13 miles north of Virginia) at 2.30 P. M., passengers reaching Virginia City at 4.30 P. M.; Gold Hill, 4.50 P. M.; Silver City, 5.15; Chinatown, 6.10, and Carson City, 7.15 P. M.

Freight trains leaving Sacramento at 6 A. M., would reach Virginia Station at 7 P. M., including all stoppages.

Returning, the passengers leaving Virginia depot at 5 P. M., would arrive in Sacramento in time to take the 2 o'clock boat, and arrive in San Francisco the same evening.

ESTIMATE OF COST.

The estimated cost of this road will be found to exceed the average cost of railroads in the Atlantic States, but is nevertheless a cheaper line than has been heretofore estimated for the crossing of the Sierra Nevada Mountains.

The rugged nature of the country over which the line passes, the character of the excavations (which for 90 miles are almost exclusively rock cuttings), the high cost of labor in California, the extra weight of rail (estimated at 75 lbs. per yard), with its cost of transportation to California, all tend to swell the cost of road beyond the average cost of railroads in the Atlantic States.

But when it is considered that this line accomplishes the crossing of Sierra Nevadas (by far the most difficult and expensive portion of the great line across our continent), is carried over an elevation of 7,000 feet in hight, entirely avoids the second summit of Sierra Nevada, saves 184 miles in distance, and $13,500,000 in cost to the Pacific Railroad, its cost of $88,000 per mile can scarcely be deemed high.

The Boston and Providence Railroad cost .....$81,273 00 per mile.
The Boston and Lowell Railroad cost..... 78,636 00 "
The New York and Erie Railroad, about..... 80,000 00 "
The Hudson River Railroad, about..... ..... 80,000 00 "

COST OF ROAD FROM SACRAMENTO TO STATE LINE, OR NEIL'S—140 MILES.

STATIONS.	Miles	Cost per Mile.	Totals.
Sacramento to Lincoln	25	$50,000	$1,250,000
Lincoln to Barmore's	6	60,000	360,000
Barmore's to Nevada Road	12	90,000	1,080,000
Nevada Road to Clipper Gap	6	50,000	300,000
Clipper Gap to Long Ravine	12	80,000	960,000
Long Ravine to Gravel Ridge	9	110,000	990,000
Gravel Ridge to Bear River	5	85,000	425,000
Bear River to South Yuba	21	100,000	2,100,000
Yuba to Hall's Canon	1	75,000	75,000
Hall's Canon to Summit Valley	11	100,000	1,100,000
In Summit Valley	2	75,000	150,000
To Summit Sierras	2	150,000	300,000
Summit to Strong's Canon	2	150,000	300,000
Strong's Canon to Truckee	10	100,000	1,000,000
Truckee to Neil's or State Line.	16	70,000	1,120,000
Add eighteen tunnels	.....	.....	870,000
Total cost to State Line	140	.....	$12,380,000

Or an average cost of $88,428 per mile.

ADDITIONAL COST TO STONE'S CROSSING OF TRUCKEE OR VIRGINIA STATION—15 MILES.

STATIONS.	Miles	Cost per Mile.	Total.
Neil's to Stout's	7	$70,000	$490,000
Stout's to Stone's	8	50,000	400,000
Total cost	15		$890,000
Making total cost	155	.....	$13,270,000

ADDITIONAL COST TO BIG BEND OF TRUCKEE OR HUMBOLDT DESERT—23 MILES.

	Miles	Cost per Mile.	Total.
Stone's Crossing or Big Bend	23	$70,000	$1,610,000
Making total cost	178	.....	$14,880,000

Or an average cost of $83,600 per mile.

ADDITIONAL COST OF A RAILROAD LINE FROM BIG BEND OF TRUCKEE TO LASSEN'S MEADOWS, OR TO A CONNECTION WITH LIEUT. BECKWITH'S LINE ON HUMBOLDT RIVER—104 MILES.

	Miles	Cost per Mile.	Total.
From Big Bend of Truckee to Lassen's Meadows	104	60,000	$6,240,000
Making total cost to Lassen's Meadows	282	.....	$21,120,000

On an average cost of $74,900 per mile.

ADDITIONAL COST OF LINE FROM LASSEN'S MEADOWS TO SALT LAKE, TAKEN FROM ESTIMATES OF LIEUT. BECKWITH, P. R. R. REPORTS—451 MILES.

	Miles	Cost per Mile.	Total.
Lassen's Meadows to Salt Lake	451	$45,000	$20,295,000
Making total cost of line from Sacramento to Salt Lake	733	.....	41,415,000

On an average cost of $56,500 per mile.

ESTIMATED COST OF LINE FROM SALT LAKE TO COUNCIL BLUFFS, BY LIEUT. BECKWITH, P. R. R. REPORTS—1,125 MILES.

	Cost of Routes
Council Bluffs to Salt Lake, 1,125 miles	$58,485,000
Making total cost from Council Bluffs to Sacramento, 1,858 miles	99,870,000
For purpose of comparison, add cost from Sacramento to Benicia, 58 miles	2,630,000
Gives total length, Council Bluffs to Benicia, 1,916 miles. Total cost	102,500,000
Estimate by Beckwith's route, 2,100 miles. Total cost	116,000,000
Saving in distance, 184 miles; in cost	13,500,000

RECAPITULATION AND ESTIMATE OF ENTIRE COST OF PACIFIC RAILROAD LINE, TAKING LIEUT. BECKWITH ESTIMATES, FROM COUNCIL BLUFFS TO LASSEN'S MEADOWS, AND THENCE VIA THIS ROUTE TO SACRAMENTO—DISTANCE, 1,858 MILES.

	Miles.	Cost per Mile.	Totals.
Council Bluffs to Black Hills	520	$35,000	$18,200,000
Black Hills to South Pass	291	75,000	21,825,000
South Pass to Fort Bridger	131	50,000	6,550,000
Fort Bridger to Salt Lake	173	60,000	10,380,000
Timpanogos Canon	10	150,000	1,500,000
Salt Lake to Lassen's Meadows	451	45,000	20,295,000
Lassen's to Big Bend, Truckee	104	60,000	6,240,000
Big Bend to California State Line	38	66,000	2,500,000
State Line to Sacramento	140	88,428	12,380,000
Total	1,858	.....	$99,870,000

The importance of this route to the great enterprise of which it is destined to form a link, cannot be more clearly manifested than in the reduction of cost in constructing the Pacific Railroad.

In all the previous comparisons of cost and distance, the Central Route has labored under great disadvantage, and has not taken the rank among routes, to which, by its merits, it was entitled.

A reduction in cost of $13,500,000, and a saving in distance of 184 miles of line, present features which may well invite consideration from the friends of that project.

GENERAL REMARKS.

It will be observed that the estimates of cost and distances from Big Bend of Truckee to Salt Lake are made upon the Beckwith or Humboldt route, a distance of 733 miles.

While it is possible that a more southerly line can be found along or near the Simpson route, in the absence of surveys, or data for estimate, no reliable opinion can be formed of its feasibility or probable cost.

Our line, at Big Bend of Truckee, is in position to join an extension on either route.

According to the itinerary of Captain Simpson, it does not appear that the more southerly route presents any advantage in distance to Salt Lake City.

The distance given by Captain Simpson from Carson City to Camp Floyd is 554 miles. Adding to this the distance from Sacramento to Carson City, 142 miles, and the distance from Camp Floyd to Salt Lake City—say 35 miles—it gives the total distance from Sacramento to Salt Lake City as 731 miles.

From our line at Big Bend of Truckee, *via* Simpson route to Salt Lake, the distance would be about the same as to Salt Lake City, on the Humboldt route, but should the main line of lower road be carried round the head of Utah Lake, and up the Timpanogos, it would make the lower line about 50 miles the shortest.

If a line can be found from the Sink of Humboldt across to Gravelly Ford (on that river,) it will shorten the Humboldt route about fifty miles.

There are three important considerations, however, which give the route up the Humboldt River a manifest advantage over any other route for a railroad line.

First—Its availability for a connection with Oregon and Washington.

Lassen's Meadows are only about eighty miles south of the forty-second parallel of latitude, which parallel is the southern boundary of Oregon, there being a good emigrant road from that point to Jacksonville and Fort Lane, in Oregon, the line following around the northerly end of Mud Lake, up Black Rock Creek, southerly end of Goose Lake, and between the Klamath Lakes to Jacksonville, from which point a good railroad line, with light grades, was found (see reports of Lieutenants WILLIAMSON and ABBOTT) to Portland on the Columbia River, the distance from Lassen's Meadows to Jacksonville being about 280 miles.

Second—The recent discoveries of silver on the Humboldt River in the vicinity of Lassen's Meadows.

The well known discoveries of silver ore in the Washoe Mountains has drawn thither, in the last two years, a population of about 17,000 souls, most of whom are hardy, able-bodied miners. Numerous flourishing towns and villages have sprung into existence, permanent improvements have been made, and but a few years will elapse before a new State will be formed out of that portion of Nevada Territory.

Within the last few months, discoveries of silver have been made on the Humboldt, which are said to rival those of Washoe. Already a new city is in existence, and hundreds of miners have gone there.

There will of course be but a small emigration there this winter; but next spring and summer will undoubtedly witness an influx of population hardly second to that of Washoe.

The mines are stated to be of great extent and richness, many of the out-croppings assaying over $1,000 per ton. A number of tons of ore have been sent to Sacramento and San Francisco for trial, the results of which have proved them to be of extraordinary richness.

Cinnabar and coal have also been discovered in this locality.

Several mills are in the course of erection, and permanent improvements are being rapidly made.

Being on the main emigrant route to California, and accessible from both Oregon and California, the accessions to its population cannot fail to be large; and it will not be many years before the new State of *Humboldt* will apply for admission into the Union.

Thirdly—From the feasibility of this as a Railroad route, and the character of soil, etc., along its route.

After striking the Humboldt at Lassen's, there are 190 miles of unobstructed valley, on which the grade for 145 miles is only four feet per mile; 36 miles are level; 24 miles has a grade of half a foot per mile; 160 miles has a grade of four feet; 50 miles has a grade of seven and eight feet; 53 miles a grade of eight and ten feet; 43 miles a grade of eighteen to twenty-one feet; 40 miles of from twenty-five to thirty-one feet: 18 miles of grade of fifty-eight feet; there being only eight miles of a higher grade, in eighty-nine feet, which can undoubtedly be reduced.

The elevation at Lassen's is only about 250 feet lower than the Big Bend of Truckee, the distance 104 miles.

There will be then 539 miles of light grades, not exceeding 31 feet per mile, on a line of 555 miles long—a feature of no little importance in determining the location of the Pacific Railroad.

The valley of the Humboldt has been traversed by many thousands of Emigrants to Oregon and California, and is well known to embrace many valleys of alluvial and fertile soil.

The general character of the soil in the great basin is barren and sterile, except where intersected by rivers. The valley of the Humboldt has received the largest share of the emigrant travel, for the reason that it afforded good grass, and water in abundance.

Being more inviting to emigrants, it will settle up more rapidly,

and thereby greatly facilitate the construction of a railroad line on this route.

Accompanying this report, will be found the following Maps, Profiles, etc.:

A. Large map on a scale of 400 feet per inch (90 feet long), showing the curves and tangents, from Dutch Flat to Truckee River, for filing in Secretary of State's office.

B. Seventeen sheets of location, numbered 1 to 17, inclusive, scale 400 feet per inch, showing curves and tangents, from Barmore's (or western base), to Dutch Flat, for filing, as above. (Also copies of same.

C. Five large maps (20 feet long), scale 400 feet per inch, showing curves and tangents, as follows:

No. 1. Barmore's to Clipper Gap.
No. 2. Clipper Gap to Dutch Flat.
No. 3. Dutch Flat to Rattlesnake Bluffs.
No. 4. Rattlesnake Bluffs to Summit.
No. 5. Summit to eastern terminus of survey.

D. Thirty-two sheets, numbered 1 to 32, scale 400 feet per inch, exhibiting the angular line as run with projected curves and tangents thereon.

E. Map (16 feet long) scale 5,000 feet per inch, exhibiting the country from San Francisco to terminus of survey, showing our line, with adjoining towns and rivers, for ten miles on either side, and connecting railroads.

F. Traced copy of the same.

G. Smaller map prepared for lithographing, showing whole country, from San Francisco to Big Bend of Truckee.

H. Britton and Rey's map of California.

I. United States Surveyor General's map of State.

J. Elliott's map of a portion of the State.

K. Ransom's map of San Francisco, and 40 miles round.

L. Map of Sacramento Valley Railroad, Sacramento to Folsom, scale 5,000.

M. Map of California Central Railroad, location, Folsom to Marysville.

N. Map of California Northern Railroad, Marysville to Oroville.

O. Map of survey, Sacramento to Benicia.

P. Map of survey, Marysville to Benicia.

Q. Map of survey, Folsom to Placerville.

R. Smith's map of survey for Canal up North Fork of American River to Lake Bigler.

S. Connected map of Lieutenant Beckwith's surveys, showing the topography, etc. from Benicia to Salt Lake.

T. Map of Captain Simpson's route to Camp Floyd.

U. Large map compiled in office of Secretary of War, showing the country west of the Mississippi River, with all the surveys for Pacific Railroad laid down thereon.

V. Smaller map of routes, as above.

W. Map of Rancho del Paso, through which our line passes.
X. Map of City of Sacramento.
Y. Map of survey across Sacramento Valley.
Z. Degroot's map of Washoe mines, also Pierce's map of Washoe.

PROFILES.

a. Sheets, 1 to 34 inclusive, working profile of line as run (horizontal scale, 400 feet; vertical scale, 30 feet per inch).
b. Profile of line to Dutch Flat (horizontal scale, 500 feet per inch; vertical scale, 50 feet per inch).
c. Two profiles of line reaching from Lincoln to Truckee River (horizontal scale, 1,000 feet; vertical scale, 100 feet per inch).
d. One profile, extending from Sacramento to Big Bend of Truckee, also showing a section of Washoe Mountains, on a line from Stout's to Fort Churchill (horizontal scale, 11,000 feet; vertical scale 600 feet per inch).
e. Copy of same for filing in Secretary of State's office.
f. Profile of Lieutenant Beckwith's line, Salt Lake to Fort Reading, containing profile of Noble's Pass.
g. Two sheets of profiles of various southern passes across Sierra Nevada (published in Secretary of War's office).
h. Barometric profile of reconnoisances in Sierra Nevada Mountains, viz.: Georgetown route; Dutch Flat Route; Henness Pass route *via* Nevada.

Also, a set of Pacific Railroad Reports, and all the maps, profiles, etc., relating thereto—published by United States Government.

Our levels indicate that many of the passes in the Sierra Nevada Mountains will be found, upon actual survey, much higher than they have been represented.

The estimates of business, and revenue of Road, will be deferred to another time in consequence of delay in procuring the statistics of the Washoe trade and business.

In conclusion, I take this opportunity of expressing my obligations to Messrs. Edward Judah, Assistant in charge of Party; John R. Brown, in charge of levels; H. T. Hall, Topographer; for the able and satisfactory manner in which they performed the arduous duties assigned them; also to Wm. S. Watson, Esq., Chief Engineer of California Northern Railroad, for valuable assistance in office; to Dr. D. W. Strong, of Dutch Flat, who accompanied me in my reconnoisance last fall, who was with me during the entire survey, and whose experience in and knowledge of the mountains was of the greatest assistance, and contributed to the success of the survey; also, to S. B. Wyman, Esq., of Virginia; Mr. Neil, of Neilsburgh;

Mr. Applegate, of Empire Mills; Messrs. Egbert and Brickell, of Illinoistown—who were with me on portions of the route; to Chas. Marsh, Esq., of Nevada, who accompanied me on the reconnoissance *via* Nevada and Henness Pass; also to Messrs. John Shaw, of Mormon Island, D. W. McKinney and Mr. Shankland, of Georgetown—who accompanied me on the Georgetown reconnoissance; also, to Mr. Stout, of Stout's Crossing, Nevada Territory; F. Moore, Esq., of Dutch Flat; and J. P. Robinson, Esq., of Sacramento, for courtesies extended.

Very respectfully,

THEODORE D. JUDAH,

Chief Engineer Central Pacific Railroad of California..

ENGINEER'S OFFICE,
CENTRAL PACIFIC R. R. OF CALIFORNIA.

SACRAMENTO, October 22, 1862.

TO THE PRESIDENT AND DIRECTORS OF THE CENTRAL PACIFIC RAILROAD COMPANY OF CALIFORNIA:

GENTLEMEN:

In accordance with a resolution of your board, passed October 9th, 1861, as follows:

"*Resolved*, That Mr. T. D. Judah, the Chief Engineer of this Company, proceed to Washington on the steamer of the 11th Oct. inst., as the accredited agent of the Central Pacific Railroad Company of California, for the purpose of procuring appropriations of land and U. S. Bonds from Government, to aid in the construction of this Road."

I beg leave to report my return to California after an absence of about ten months, having fully accomplished the objects of my

mission, a detailed and full account of which is herewith appended, marked document "A."

A brief statement of some of the advantages accruing to your Road through its connection with the Pacific Railroad bill, recently passed, seems necessary, in order to realize its advantages, and secure the benefits and public consideration to which it is justly entitled.

The theory of the Pacific Railroad bill recognizes existing Companies at either end of the Road; while the central division, or portion between the States of Kanzas and California, is committed to the supervision of a company created by Act of Congress, deriving its existing powers and authority from the bill itself.

Upon the eastern side, the right to construct the road, from the junction of the Missouri and Kanzas Rivers, through Kanzas, to the 100th meridian of longitude west from Greenwich, with all the grants, donations, etc , for about 350 miles, is given to the *Leavenworth, Pawnee, and Western Railroad Company of Kanzas.*

The central division, or portion through the Territories of Nebraska, Utah and Nevada, to the eastern boundary of California, a distance of about 1300 miles, is given to the *Union Pacific Railroad Company, a Corporation created by Act of Congress;* while the construction of the western division, reaching from the eastern boundary of California, to the navigable waters of the Sacramento River, or to the City of San Francisco, is assigned to the *Central Pacific Railroad Company of California,* to whom are made the grants of lands, bonds, etc., for that purpose.

The aid granted by the United States Government, to your Road, is liberal, and will materially assist in constructing and completing it.

ENUMERATION OF ADVANTAGES.

The first important advantage derived by your Road, consists in the grant of the free right of way to a strip of land 400 feet in width across all Government lands.

This is a liberal width, and *precludes the possibility* of building a parallel road over your route, at many points, without occupying a portion of your lands.

Secondly. The United States Government is obliged to *extinguish*

the Indian title to all lands donated to the Company, either for right of way, or to the land granted on either side of your road.

Thirdly. In order to prevent speculation by individuals, who may enter upon and take up these lands, *after* the passage of the Railroad bill, and *before the Company has time to locate its line with accuracy*, it is provided "that within two years after the passage of this act, said Company shall *designate* the general route of its road, as near *as may be*, and file a map of the same in the Department of the Interior, whereupon the Secretary of the Interior shall cause the lands within fifteen miles of said *designated* route, or routes, to be *withdrawn* from pre-emption, private entry and sale; and when any portion of said route shall be finally located, the Secretary of the Interior shall cause the lands hereinbefore granted, to be surveyed, and set off, as fast as may be necessary, for the purposes herein named."

Before leaving Washington, I made a proper map, showing the general route of our road, in accordance with the provision of the bill, which map, accompanied by a written designation of the route, I filed with the Secretary of the Interior, who assured me that he would give the necessary instruction to have the same withdrawn from market. *This has been done. Such lands are now secured to us*, and cannot be pre-empted or purchased, until after our final location, and until a survey by the United States authorities of these lands.

The Department of the Interior also expressed a desire to cooperate with our Company *in preventing the cutting of timber on these lands.* It becomes, therefore, important for your board to decide, if they will take any steps to prevent depredations upon these timbered lands, until a final location is made of the whole, or a part of their road.

Fourth. A grant of United States Bonds, to the amount of about $6,000,000 is made to this Company. These bonds run for 30 years, draw interest at the rate of six per cent., payable semi-annually, by United States Government, *who cannot redeem them until their expiration*, or, for, say, 30 years, as is the case with their issue of 20 year bonds, which are redeemable, after five years, at the option of the Government.

They are, therefore, the best class of Government bonds in market, and will lead all others of her securities, now issued.

These bonds enure to your Company, as *each section of* 40 *miles*

is completed, west of the western base of the Sierra Nevada mountains, at the rate of $16,000 per mile,—while for 150 miles from such western base easterly, the amount *is increased to* $48,000 *per mile,* and the same are paid over as *each section of* 20 *miles is completed.*

Your road exhibits a remarkably favorable peculiarity in this respect.

While most of the Railroads constructed in the United States, are encumbered with issues of mortgage bonds, *on which the yearly interest must be paid, as well as the bond itself at maturity,* usually taking, for that purpose, the earnings of the road, which otherwise would be applied to the payment of dividends to stockholders.

Your Road, *instead of issuing her own bonds,* for the payment of which, and the interest, she would have to provide, *receives all the benefits of nearly* $50,000 *per mile, or an aggregate of* $6,000,000, *of United States bonds,* the interest on which is regularly paid by the Government, until their maturity. It is true that Government contemplates the repayment of this loan at that time, but it is obvious that Government will furnish very nearly business enough to the road, to repay them before the bonds become due. Therefore, instead of appropriating the net earnings of your road yearly, to the payment of interest on bonds, *there is no reason why such earnings* should not go to the stockholders in the shape of dividends.

This feature, peculiar to your road, is deserving of especial consideration. These bonds will, probably, command a premium in market, and, whenever our present difficulties are settled, will be sought after *in preference to all other issues, for foreign investment.*

Fifth. The *right to extend the road* from Sacramento to San Francisco, is given to your company, with all rights, grants, donations, etc., given to that portion of the line, west of the western base of the Sierra Nevada.

Sixth. Perhaps the most important feature in the grant, made to this Company, exists in authorization, or *right given it to continue on from the easterly line of the State of California eastwardly,* and construct the line of Pacific Railroad and Telegraph, until it meets and connects with the line of the Union Pacific Railroad and Telegraph, coming from the east.

This virtually concedes to your Company the right to construct at least one half of the line of the Pacific Railroad, and to receive all the grants, donations, etc., therefor, without absolutely compelling them so to do.

It becomes important, therefore, that a Railroad survey be made from the eastern boundary of the State eastwardly, to, say, Salt Lake, for the purpose of determining the cost of a Railroad line, and to ascertain if sufficient inducement exists for your Company to construct said road. I am positive in the opinion, that it will be found advisable *to undertake the construction of about* 300 *miles next easterly from the State line of California.*

VALUE OF LAND GRANTS.

The United States Government donates to your Company every section of land (not sold, pre-empted, or otherwise disposed of), for a distance of ten miles upon either side of the road. Mineral lands are excepted from the operation of the Act, but wherever the same contains timber, the timber thereon is granted to the Railroad Company.

The quantity of land, (if it were all available to the Company), would be 6,400 acres per mile, or about 960,000 acres between Sacramento and the eastern boundary of the State. From the western base of the Sierra Nevada to State line, nearly all of these lands are covered with timber, which becomes valuable as soon as a railroad is built, on which it can be transported to market.

It is always difficult to estimate the worth of timber lands, their value being dependent upon their quality, the density of the timber, the demand for, and facilities for conveying it to market.

The Saratoga and Sackett's Harbor Railroad Company, of the State of New York, who have 500,000 acres of timber land in that State, in a report published by them, estimate the avails of its yield as follows:

ESTIMATED TIMBER VALUE OF LANDS BELONGING TO THE SARATOGA AND SACKETTS HARBOR RAILROAD.

Products.	Quantity.	Retail Price at Tide water	Total value at Tide water	Corded on Line of Road.	Freight on their Railroad.	On other Connecting Roads	Nett Proceeds
Wood	30 Cords	$ 5 00	$150 00	$ 30 00	$ 75 00	$ 15 00	$ 30 00
Spars	1 128-1000	150 00	192 00	16 67	16 67	3 33	162 00
Hemlock Bark	5 Cords	7 00	35 00	12 50	12 50	2 50	15 00
Pine Lumber	2,280 Feet	22 00	50 16	5 70	5 70	1 14	31 92
Spruce	13,680 Feet	10 00	136 80	34 20	34 20	6 84	27 36
Maple	6,840 Feet	15 00	102 60	17 10	17 10	3 42	47 88
Total.			$666 56	$159 00	$161 17	$ 32 23	$314 16

Thus it will be seen that they estimate their spar timber at 1 $\frac{128}{1000}$ spars per acre, as yielding a nett profit to them of $162 per acre or a total of $81,000,000.

The whole nett proceeds of the production of their lands, they estimate at $341 per acre, or an aggregate in round numbers of $157,000,000. Their lands they assume to be worth $15 per acre, afterwards, or $7,500,000.

They estimate the freights derived from one acre of timber land and accruing to the Railroad Company, to be $161 17, which on their 500,000 acres amounts to $80,585,000. They also make the statement, based upon the production of a good farm on the Illinois Central Railroad as a guide, that there is more freight on their landed estate now ready for the cars, than can be produced from the original and entire estate of the Illinois Central Railroad Company in more than one half a century..

They also state, that a committee of capitalists, proposing to become interested in this work, personally traversed the route of their Road, and made a report thereon, from which the following extracts were taken. They say: "The Engineer states, and your Committee confirm his statements, from personal observation, that this Road for more than seventy-five miles, passes directly through a wilderness, as remarkable for its density and extent, as any other in this country.

"The land for ten miles on each side of the road, and for ten miles from the margin of the lakes, is groaning under the weight of an immense amount of most valuable freight, all of which is wanted at tide-water as speedily as it will be in the power of the Road to transport it. There is more freight on the surface now ready for use, than could be grown upon a cultivated country in more than half a century. The weight of lumber, etc., is about seventy tons per acre. The average weight of products of an agricultural country does not much exceed one ton per annum per acre."

Thus are the products of a timber domain estimated, *when railroad facilities are afforded* with which to carry its products to market.

It is not expected that the timber land belonging to your Company will prove as profitable as that estimated by the New York Company, *nor is this estimate here introduced to promulgate such an*

idea, but for the purpose of illustrating the *difference in value* between a timber estate *without*, and one *with* facilities for conveying the same to market. While this is the case, the fact cannot be controverted that your Company possesses about 500,000 acres of timber land, which will, by the construction of your road through it, become immediately available and largely enhanced in value; and if we allow that 300,000 acres, or one-third of this land, contains *only ten trees per acre*, from which can be cut six logs twelve feet long per tree, averaging twenty-four inches square, this gives 3,400 feet, b. m., per tree, and the total quantity amounts to ten thousand millions feet of lumber, which delivered at Sacramento at, say $15 per thousand, amounts to one hundred and fifty millions of dollars; or calling this lumber worth, standing, one dollar per thousand, it would be worth $10,000,000 to the Company.

It is well known that the sugar pine of these lands often runs 125 feet high without a limb, and often measures eight feet through at base—while a tree is seldom found measuring less than three and one-half feet at base. Cut but one tree per acre per year, and it gives an annual yield of 1,000 million feet of lumber—three million feet per day, equal to 5,000 tons per day, or, say, 1,750,000 tons per year.

Allowing the 500,000 acres instead, to yield fifty cords of wood per acre (a very low estimate) and it amounts to twenty-five million cords of wood, which, if delivered at Sacramento at $6 per cord, would amount to 150 millions of dollars, and pay the road about 100 millions of dollars freight.

It is well known that the supply of wood is becoming more scanty, and is rising in value yearly.

What then may we estimate the value of this domain in years to come, not only to the Company, as owners, but to the railroad as a source of revenue in its transportation, and to the community, who are obliged to use it.

Wood is now worth $18 per cord in Washoe, and in the winter commands $40 per cord. In fact, the cost of hauling is so great that not a few mills have been compelled to stop work, and are now idle in consequence.

How difficult it is then to realize the immense value of this estate, which belongs to your Company, *by absolute grant from the United States Government*, and to which you hold as title, which *cannot be disputed or disturbed.*

REVENUE.

In estimating the revenue of your road, it is gratifying to be able to arrive so correctly at its probable business from statistics of actual business, now performed over the same route, exclusively by freight teams and stages.

It may be truly said, that no road was ever constructed or contemplated in the United States, or elsewhere, that promised as large and speedy a return upon investment, as the one proposed to be constructed by you between the city of Sacramento and the Washoe silver mining district.

The extent of the existing trade now performed over this route by teams and stages, can be scarcely realized, except upon careful inquiry and investigation. It is difficult to credit the statement that *over five millions of dollars per year is paid out for freight alone to Washoe,* but rigid scrutiny and investigation bears out the assertion, which seems to be entirely within bounds—and this trade is increasing and growing every day.

Your road, when *completed,* from Sacramento to Washoe, will perform—

1st. The local business of Placer, Nevada, Sierra, Plumas, and a portion of that of El Dorado county.

2d. Over its first 25 miles, the northern business, now performed by stages and steamboats.

3d. The entire freighting and passenger business of Washoe, Esmeralda, Carson Valley, Pyramid Lake and Humboldt, and a portion of the Salt Lake business.

It is to be observed that the freighting business to the mountains and to Washoe is now performed entirely by teams; there is no other way of forwarding goods to the interior.

The lowest price paid for freighting to Washoe is four cents per pound, or $80 per ton, and that only when the roads are in good condition.

When the roads are not in good condition, or when there is a large amount of freight offering, this price is increased to six, eight and ten cents per pound.

A peculiarity of Washoe is, that it is situated in a section of country so barren and sterile that nothing but a scanty supply of vegetables can be raised there. Every thing used there to eat or

wear, all necessaries of life, as well as all manufactured goods, have to be transported by wagons or mules. The inhabitants, therefore, are absolutely compelled to draw their supplies of all kinds from the western side of the Sierra Nevada Mountains, and in paying for their supplies, to pay the additional cost of freighting by wagons, at from four to ten cents per pound.

This is the business proposed to be performed by your Railroad, when constructed, and it is obvious that it will be entirely commanded by your Road without competition. With a Railroad built to Washoe, this business cannot be performed by any other means, or in any other manner.

In addition to this large and increasing business, may be reckoned that of supplying lumber, timber, and logs for consumption and for timbering the mines; also, fuel for consumption in the cities of Nevada Territory, and to supply the mills, a majority of which are run by steam.

As has been previously observed, wood is worth at the present time $18 per cord, and in the winter will be worth $40 to $50 per cord, and many of the mills are obliged to cease running in consequence.

Your railroad will supply this fuel from the timber on its own lands, and at such a reduction in price *as will enable these mills to run through the entire year.* It is a fact worthy of observation, that the construction of this road will *save to the residents of Washoe and Nevada Territory, over* $2,500,000 *yearly.*

In order to obtain accurate information with regard to the business now performed over what is known as the Placerville road to Washoe, I have stationed a trustworthy and reliable agent at Strawberry Valley, (J. R. Atkins, Esq.,) who has taken a careful and correct account of the travel passing that point for eight weeks, commencing August 16, 1862, and terminating October 10, 1862, or for a period of fifty-six days.

Every team going and returning was counted each day, and Mr. Atkins' returns present a complete statement of the weight and nature of each load, the number of horses, mules or oxen, of stages and stage passengers, buggies and occupants, riders, footmen and loose stock.

It is to be borne in mind that these are the returns on only one road to Washoe; the different roads are enumerated as follows:

Big Tree Road.
Amador Road (new road).
Placerville Road.
Henness Pass Road.

Which comprises the Nevada road, the Marysville, San Juan and Downieville roads, and the Sierra Valley and Beckworth's Pass road.

A compilation of these returns is herewith presented:

ACTUAL COUNT OF TRAVEL ON THE PLACERVILLE WAGON ROAD TO WASHOE AND NEVADA TERRITORY FOR EIGHT WEEKS, ENDING OCTOBER 10, 1862.

Number of Stages bound up	169
Number of Stages bound down	171
Number of Buggies bound up	61
Number of Buggies bound down	46
Number of Stage Passengers up	1,287
Number of Stage Passengers down	785
Number of Travelers, other than Stage passengers, up—riders, footmen and in buggies, (including emigrants)	1,288
Number of Travelers, etc., down	2,508
Loose stock, of all kinds, up	573
Loose stock of all kinds, down	434
Number of Teams bound up	4,142
Number of teams bound down	4,464
Number of Animals in teams, up	22,728
Number of Animals in teams, down	22,803
Number of pounds of Freight, up	19,386,200
Number of pounds of Freight, down	

Teamsters are not included in the above return.

RECAPITULATION.

	FOR EIGHT WEEKS.			FOR ONE DAY.		
	UP.	DOWN.	TOTAL.	UP.	DOWN.	TOTAL.
No. of Stages	169	171	340	3	3	6
No. of Buggies	61	46	107	1	1	2
No. of Stage Passengers	1,287	785	2,072	23	14	37
No. Travelers, Footmen, and in Buggies	1,287	2,508	3,790	23	45	68
No. loose stock, all kinds	573	434	1,007	10	8	18
No. of Teams	4,142	4,464	8,606	74	80	154
No. of animals in teams.	22,788	22,003	45,591	407	407	814
No. pounds of Freight	19,286,200		20,000,000	346,185		357,000
No. tons of 2,000 lbs	9,683		10,000	173		178

From which it appears that the daily average of loaded teams bound up is..... 74
The number of tons of freight transported daily up is..... 178
The number of stage passengers both ways is..... 37
The total number of travelers, including stage passengers..... 105

Allowing 18 days as the average time of a trip, and the number of teams and teamsters employed, amounts to 2,772, and of animals, 14,652.

At the present date, Oct. 22, 1862, the price of freight is seven to eight cents per pound.

Estimating the yearly average of freight over the Placerville road to be 120 *tons per day*, at an average price of *six cents per pound, and the total amount paid for freight alone, amounts to* $5,256,000 upon this one road.

A four horse or mule team, which makes the trip in about sixteen days, pays for tolls $22 75; a six horse or mule team pays $30 tolls. Averaging the time at eighteen days, the tolls at $25 per trip, and we find that the enormous sum of $693,000 per year year is paid for tolls by freight teams.

The returns show that the stages average 37 passengers per day, which, at $30 per passenger, amounts to $405,150. It is believed, however, that the total receipts of the stage line exceeds this sum.

It will be observed that 68 additional travelers per day, or nearly double the number carried by stage, pass over this road, at least one half of whom would probably take the cars, were a Railroad completed.

From an entirely reliable source, I have ascertained that the total amount of silver bullion brought down by Wells, Fargo's Express, for the ten months of 1862, is over 150,000 pounds, and may be safely stated at 200,000 pounds for the entire year.

Its value is not, of course, known, gold being mixed with it, but it is safe to estimate it at $30 per pound, or a total value of $6,000,000.

This is only what comes by Express, and does not indicate the amount actually taken out, and retained there, or sent down by private conveyance.

It is estimated by Wells, Fargo & Co., that this amount will be doubled for the year 1863, and in 1866, reach twenty-five millions of dollars.

It would, perhaps, be proper, therefore, to assume that, upon

the completion of your road, at a charge of one per cent., an additional revenue of at least $200,000 per year would be derived from this source.

ESTIMATED ANNUAL RECEIPTS OF ROAD IN CALIFORNIA.

PASSENGERS IN CALIFORNIA.

10 Ranch passengers, per day, each way.
10 Lincoln " " "
30 Placer Co. " " "
30 Nevada Co. " " "
40 Marysville and North " "

120 total, each way.
240 total both ways, or

75,120 yearly Lincoln passengers @ $2	$150,240
10,000 way passengers beyond @ $5	50,000
Gives as total receipts from passengers	$200,240

FREIGHT IN CALIFORNIA.

25 tons ranch freight.
20 tons Lincoln freight.
50 tons Placer County freight.
75 tons Nevada County freight.
75 tons Marysville and North freight.

245 tons freight per day.

82,000 tons per year, to Lincoln, @ $2 50	$210,000
22,000 tons per year, to points beyond, @ $5	110,000
25,000 tons return freight, cobble and stone, @ $1	25,000
50,000 cords wood, @ $2	100,000
18,250 M feet of Lumber, @ $5	91,250
Total receipts from freight,	$536,250
Add Passengers,	200,240
Gives as total receipts,	$736,490

ESTIMATE OF ANNUAL RECEIPTS FROM WASHOE BUSINESS.

On 160 *miles of Railroad completed from Sacramento to Stone's Crossing of Truckee River, or Virginia Station, from statistics of Placerville Route as a basis.*

WASHOE BUSINESS.

43,800 tons up freight, @ 2 cents per pound,	$1,752,000
30,000 tons down freight, @ 1 cent per pound	600,000
25,550 passengers, @ $15	383,250
50,000 cords wood, @ $5	250,000
18,250 M feet Lumber, @ $10	182,500
Express, Mails, etc.,	50,000
Total receipts, as per statistics of Placerville road,	$3,217,750
Add 25 per cent. from passengers and freight from otherwards,	700,000
Total receipts of Washoe business,	$3,917,750
Add receipts for local California trade,	736,490
Gives as total receipts of road	$4,654,240
Deduct all expenses of operating road, repairs, taxes, etc.	1,000,000
Leaves, as net revenue,	$3,654 240

Which is equivalent to an annual net profit of 25 per cent. upon a cost of fifteen millions of dollars, or monthly returns of two per cent. per month.

Upon completing the first division of fifty miles, your road will perform, in addition to the local business of Placer, Nevada, Sierra and Plumas counties, and the Marysville and northern business, a *greater portion of the present Washoe business* over such division of fifty miles.

In addition, therefore, to the estimated receipts from California business, it will be proper to add as follows:

WASHOE BGSINESS ON FIRST FIFTY MILES.

30,000 tons freight, @ $5	$150,000
15,000 passengers, @ $3	45,000
Mails and express	15,000
Total	$210,000

Add total California receipts, less $80,000, estimated for points beyond Lincoln..... .....$656,490

Gives as total receipts, fifty miles.....$866,490
Deduct all expenses, operating, etc..... 150,000

Gives as net profits.....$716,490

Or an annual net profit of twenty-four per cent., or monthly return of two per cent. per month.

That these results appear large is true, but it is no less true that the conditions which produce these results are extraordinary, and *unlike* those which govern the business conditions of any other Railroad ever built, with one exception, viz: the Panama road.

The charge for transporting a ton of freight over a Railroad 160 miles long in the Atlantic States, would be from four to five dollars—say five dollars.

As has been previously observed, the *lowest* rates for freight over the line of your road by wagons, are $80 per ton; while the average cost by wagon is over $100 per ton.

A reduction in price to $40 per ton by Railroad, and a saving in time from nine days to one day, would give satisfaction to both merchants and consumers, and secure every pound of Washoe freight over your road. The receipts being at least eight times those of a Railroad in the Atlantic States performing the same business—while the expenses of operating your road will not be in the same proportion.

Statistics of Railroad operations, show the cost of fuel to be a prominent item in the cost of operating Railroads, and this feature is nowhere more clearly shown than in a comparison of the difference in cost of operating the Baltimore and Ohio Railroad, and the New York Central Railroad, to roads of about equal length. The first named road using coal procured from the line of their road at cheap cost, while the latter is compelled to supply itself with fuel at what may be considered a high price.

The cost of fuel upon the line of your road will be simply the cost of cutting it, which can be contracted for to any extent at not over one dollar per cord—and the supply may be considered, for all practicable purposes of your road, as inexhaustible. It is to be remembered, however, that the supply of fuel for operating the Pacific Railroad as far east as Salt Lake, will have to come from the

Sierra Nevadas, and in all probability from your lands. It is a source of congratulation, therefore, that you are so liberally provided with that article most neeeded in the future, and in fact absolutely essential in conducting the future operations of the road with economy.

It has been stated that the cost of operating roads, having heavy grades and high summits, is greater than upon valley roads, and that this argument applies to your road. This is, in a measure, true; but an analysis which resolves the elements of this increased cost, will prove that it is mainly owing to the necessity of employing *greater locomotive power* with which to overcome these grades and summits, equivalent to the use of *more steam*, or, in other words, *more fuel*. Therefore, it may be fairly stated, and can scarcely be denied, that this objection does not apply with its usual force to your road.

RETURN FREIGHTS OF SILVER ORE.

Without entering into the details of this subject, it may perhaps be sufficient to say that the business of carrying return freights of low grades of silver ore for foreign shipment at San Francisco, can be made a profitable business to the road.

The following extract is taken from the communication of a firm in San Francisco (date of November 4, 1860, or a year ago,) who were conversant with that branch of business, and who were at the time supplied with foreign capital for this very purpose. They say:

"There are now, probably, forty to fifty mining claims being worked, from which not less than two hundred tons of ore are being taken out daily, that would warrant shipment at a low rate. There are four first class mines, viz: the Ophir, Mexican, Central, and Gould and Curry, that alone are capable of turning out that quantity of ore, of sufficient value to warrant transportation by Railroad to this place for shipment.

It is only necessary to furnish facilities for cheap transportation, to insure the opening and working of hundreds of rich claims, capable of turning out an almost incredible quantity of ore, every ton of which would meet with ready sale on its delivery at either terminus of the road. It is a safe calculation to estimate that five hundred tons of ore daily, would be sent over such a road, at a rate of freight not exceeding say $25 per ton. In fact, the only limit to the quantity would, perhaps, be the inability of the road to do the business offered.

There are, at the present time, a number of agencies of eastern and foreign capital, armed with authority and means to purchase, at remunerative prices to the producer, ores of any grade, from $100 per ton and upward; but, owing to the limited quantity arriving, have not been able to purchase a fraction of the orders in hand. It is difficult to say what would be the limit to the amount of capital seeking investment in this channel. It is safe to say that five thousand tons of ore could be sold for cash, at this moment, if it could be had.

In regard to the benefit to the State and cities of California, that would arise from the enterprise proposed by you, it is almost impossible to calculate its extent. That it would make it the richest and most prosperous State in the Union, there is not a doubt. This new resource of wealth is unbounded, and the only obstacle to its realization, is that which your project will most certainly remove."

The capacity of your road for the performance of a business of this kind, may be estimated by a comparison with that of similar roads.

The Mine Hill and Schuylkill Haven Railroad of Pennsylvania, possesses grades of two hundred and fifty feet per mile. The tonnage of coal over this road, which (it is to be borne in mind) is one way, was as follows:

For 1855	1,534,876
For 1856	1,614,887
For 1857	1,564,119
For 1858	1,452,083

Or an average of about five hundred tons per day.

DESCENDING GRADES FOR RETURN FREIGHT.

It will be remembered upon your road the up grades are principally ascending eastwardly, while the return loads are carried mostly on down grades. Its capacity, then, for return business, is not to be judged by the character of its ascending grades.

Trusting that the above report may serve to explain the permanent features of this enterprise, and soliciting your indulgence towards any imperfections or omissions it may contain, arising from want of time and unavoidable interruptions,

I am, very respectfully,

THEODORE D. JUDAH;

Chief Engineer C. P. R. R. Co. of California.

7

REPORT

OF THE

CHIEF ENGINEER

UPON

RECENT SURVEYS, PROGRESS OF CONSTRUCTION,

AND AN

APPROXIMATE ESTIMATE OF COST

OF

FIRST DIVISION OF FIFTY MILES

OF THE

Central Pacific Railroad of Cal.,

JULY 1st, 1863.

SACRAMENTO:
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1863.

CALIFORNIA STATE LIBRARY

REPORT OF THE CHIEF ENGINEER.

ENGINEER'S OFFICE,
JULY, 1863.

To the President and Directors of the Central Pacific Railroad Company of California:

GENTLEMEN—Herewith I present a Report upon the recent surveys, progress of construction, and an approximate estimate of the cost of the 1st Division of 50 miles of your road.

It being determined to place a portion of the work upon the 1st Division under contract during the Fall and Winter of 1862, surveys for the purpose of determining upon the line were commenced in October, 1862.

The first question arising upon location of the road was to determine it the present Sacramento Valley Railroad and its extension to Auburn Station could be used and made available as a portion of the location of our road. The advantage to be gained by adopting these lines were, the saving of time in work of construction, and the removal of rivalry and competition in business.

Upon investigation many and serious objections presented themselves. 1st. From foot of K street to Auburn, via Sacramento Valley Railroad, 43 miles; from foot of K street to Auburn, via Antelope line, 35 miles; difference in distance against Sacramento Valley Railroad, 8 miles.

2d. A clause in the Pacific Railroad Bill expressly says that no part of the appropriations therein contained shall apply to that portion of any road now constructed, a prohibitory clause which nothing but further legislation would remove.

3d. Another clause in the Pacific Railroad Bill requires all iron used in construction of road to be American iron. The iron upon the Sacramento Valley Railroad, being English, while that upon the Sacramento, Placer and Nevada Railroad, although American, weighing only 52 pounds per yard (a weight too light

for our purpose), presented another objection requiring further legislation.

4th. Another clause in the Pacific Railroad Bill requires that the mortgage to the United States shall be a *first mortgage*, a provision which could not be complied with without retiring the present issue of Four Hundred Thousand ($400,000) Dollars First Mortgage Bonds of that road, having about twelve years to run, drawing 10 per cent. interest, many of which are in the hands of foreign holders.

5th. The nominal cost of the Sacramento Valley Railroad was about $1,500,000, represented as follows:

1st Mortgage	$400,000
2d "	367,000
Stock	800,000
	$1,567,000

Although not the actual cash cost of the road, yet it stands represented by securities to that amount, and it is not likely that the bond-holders would consent to give up their 10 per cent. bonds for anything less than par, if indeed they would consent to part with them at all. This, then, is the nominal cost of that road as it now stands; but in order to place it in the position of a first class road, according to the terms of the bill, it would be necessary to relay it with new iron (the old iron being defective and nearly worn out), also to partially relay it with new ties; also to replace the wooden culverts with stone, and the trestle work with piers and abutments of masonry, and bridges; also to purchase anew a portion of the locomotives and cars, and to place the balance in complete repair, and alter the present equipment to conform to the new guage of 4' 8½"; also to erect suitable and permanent depot and other buildings in Sacramento, as follows:

2,000 tons new iron, delivered at $90	$180,000
40,000 cross ties, delivered at 70c	28,000
Permanent culverts and bridges on line	35,000
Bridge across American river	40,000
New locomotives and cars	35,000
Altering over and repairing equipment	20,000
Buildings, etc., at Sacramento	25,000
	$363,000
Deduct 2000 tons iron sold at $40	80,000
	$283,500

Making an expenditure in cash, say $285,000, in order to render it a first class road.

When we consider that the total cost of grading, ties, and track laying from Sacramento to Grider's (a point 3 miles nearer Auburn than Folsom) is but $400,000 (including American river bridge), of which but $250,000 in cash is paid by the Company, there can be but little question as to the wisdom of the course adopted in building a new line.

6th. A location to Grider's will secure to this road, in connection with the California Central Railroad, the Marysville and northern business, and prevent the construction of a new line reaching from the Lincoln line to Sacramento.

These considerations, therefore, have governed this Company in adopting the direct route via Grider's, and settled the question of location so far as the Sacramento Valley Railroad is concerned.

DESCRIPTION OF LINES SURVEYED FOR CENTRAL PACIFIC RAILROAD OF CALIFORNIA.

Barometrical reconnoisances have been made upon five different routes across the Sierra Nevada mountains, as follows:

BAROMETRICAL RECONNOISANCES.

1st. A route via Folsom, Greenwood and Georgetown.

2d. A route via Auburn and Illinoistown, Dutch Flat and Donner Pass.

3d. A route via Nevada and Henness Pass.

4th. A route via Downieville and Yuba Gap.

5th. A route via Oroville, Bidwell's Bar, Middle Feather River and Beckwourth's Pass.

ROUTE VIA GEORGETOWN.

Commencing at the terminus of the Sacramento Valley Railroad at Folsom, the distances were taken by odometer, and elevations by aneroid barometer, to a point 78 miles from Sacramento; thence aneroid observations were extended to the summit of the Sierra Nevada mountains, near the head of the middle fork of the American river, following the ridge between the south fork of the American and its northern tributaries, and middle fork of the American—the barometrical observations indicating that a grade of 150 feet per mile would be necessary in order to overcome the summit upon that route.

Commencing at Folsom the line of observations were as follows: Sacramento Valley Railroad Depot, Spruance's, Shaw's

Bridge across south fork of American River, Negro Hill, Berry's, Atchinson's, Young's, Cooper's Ravine, Bailey's, Knickerbocker Ranch, Harris' Ranch, Penobscot House, Greenwood, Halfway House, Georgetown (54 miles from Sacramento), Clipper Mills, Castle Hill, top of hill, foot of hill, Creek, top of hill, Work's Ranch, Cabin, Richardson's, Volcano Mill, top of hill, Emigrant Road, top of hill, Log Shanty, Ballard's, Pilot Creek, Ice House, Stockton's Upper Store, head of Pilot Creek Ditch, top of ridge.

Leave Emigrant Road 78 miles from Sacramento; leave Waggons, point in ridge, do. do.; descend to bottom of Middle American river, foot of hill; point in river do.; leave river and ascend to top of ridge, camp, summit of Sierras, distant 97 miles from Sacramento.

2D.—ROUTE VIA AUBURN, ILLINOISTOWN AND DUTCH FLAT.

As the located line of road follows this route, and is more particularly described herein, a further description of this barometrical reconnoisance is deemed unnecessary.

3D.—ROUTE VIA NEVADA AND HENNESS PASS.

Commencing at Folsom the observations were taken at the following points: Sacramento Valley Railroad Depot, Rock Springs, Mountain House, Dutch Ravine, Auburn Forks, Illinoistown Road, Dry Creek, Foster's, English Bridge, Globe Ranch, Wolf Creek, Boston Ravine, Grass Valley, Nevada, Turner's Mill, Blue Tent, South Yuba, Bell's Ranch, Lake City, Junction House, Devil's Backbone, Humbug Road, Snow Tent, Cherry Hill, Magenta Flume, Eureka, Forks, top of divide, Bowman's Ranch, Canon Creek, Eureka Ditch, Canon Creek Summit, Jackson's, Downieville Road, Old Emigrant Road, Henness Pass, Webber's Lake, Truckee Falls, Maples, Tule Lake House, Hunter's Ranch, Sardine Valley, Dog Valley, Neil's Ranch, State Line—143 miles.

This line was found impracticable on account of the crossing of the South Yuba, and objectionable from the absolute necessity of making a long detour, either to the north or south, in order to get from the Henness Pass to the plateau of the Truckee river, to avoid Dog Mountain, also from its moderately descending grade eastwardly, and consequently high elevation through the snow region.

4TH.—ROUTE VIA CAMPTONVILLE, DOWNIEVILLE, NORTH YUBA AND SIERRA VALLEY.

Commencing at the terminus of the California Central Railroad, at Lincoln, the line of observation was as follows: Lin-

coln, Kennebec Bar, Long Bar, Timbuctoo, Smartsville, Empire Ranch, Deer Creek, Keystone House, Ankeny's, Pleasant Valley House, Bridgeport, South Yuba, French Corral, Brickville, Sweetland's, San Juan, Freeman's Crossing, Middle Yuba, Camptonville, Sleighville House, Top of Ridge, Mountain House, Goodyear's Bar, North Yuba, Downieville, Mooney's, Charcoal Flat, Lima City, Howard's, Yuba Gap, Hale's, Sierra Valley.

From this point the railroad line would extend northeasterly through Sierra Valley, passing out through Beckwourth's Pass, and connect with the line of observations taken upon the Middle Feather river route; but in order to ascertain the hight of the divide between Sierra Valley and Little Truckee, or Maple's Creek, and the elevation of Dog Mountain route, the observations were extended on this line, continuing as follows: Arms Store, Summit of Divide, Forks Henness Road, Triplet's, Sardine Valley, Junction Truckee Emigrant Road, Perkins', Dog Valley, Top of Dog Hill, Neil's, Stout's, Junction Fuller's Road—145 miles.

The objection to this route was found in the rugged nature of the country through which it passed, the expensive crossing of Deer creek, south fork of Yuba, and the numerous deep ravines of their tributaries, and the necessity, as in the Henness route, of making a detour north through Sierra Valley and Beckwourth's Pass, in order to reach the valley of Truckee river.

5TH.—ROUTE VIA OROVILLE, BIDWELL'S BAR, MIDDLE FEATHER AND BECKWOURTH'S PASS.

Commencing at Oroville the line of observations were taken as follows: Oroville, North Fork, Bidwell's Bar, South Fork of Feather, Union Bar, Kanaka Bar, Bald Rock Canon, Indian Crossing, American Bar, Long Riffle, South branch of Middle Feather, Millsop Bar, Rinehart's Bar, Marble Cone No. 1, Marble Cone No. 2, China Wing Dam, French Cabin, Saw-Mill, Hartman's Bar, Delap's Wing Dam, Pyramid Rock, Scrubby Jacks, Rich's Point, Butte Bar, Onion Valley Creek, China Bar, Last Chance Ravine, Railroad Ravine, Gap Point, Webb's Bar, Colby's, Minerva Bar, Washington Bar, Rich Bar, Winters' Creek, Sailors' Bar, Nelson's Point.

From Nelson's Point in bed of Middle Feather river, 80 miles from Oroville, for next 17 miles (the river rising at an uniform grade, without obstruction), the line of observations were carried to the North across the divide between Middle Feather and Spring Valley Creek, a tributary of the north fork of Feather, as

follows: Nelson's Point, Flume, top of divide, foot of divide, Spring Garden Ranch, Bear Trap, Misenhamer's, top of hill, Cunningham's House, Jackson's, top of hill, foot of hill, Middle Feather River, 97 miles from Oroville, at which point the line of observations again touch the bed of the river, and are continued on as follows: Lower Ford, Upper Ford, Penman's. Leave river at 100 miles from Oroville. For next 10 miles, the observations were taken upon a line north of river as follows: Leave river top of Anthony's Hill, Anthony's House, Poplar Creek, point of river, 112 miles from Oroville, thence via river as follows: Point of river, north branch middle fork Feather, Beckwourth's House, foot of Sierra Valley, Butte Cabin in Sierra Valley, Bingham's Ranch, Marsh's Summit House, Beckwourth's Pass (131½ miles from Oroville); thence the line turns to the south and follows down through Long Valley and Pea Vine Valley to Truckee River at Fuller's Crossing, as follows: Beckworth's Pass, foot of pass, Long Valley, Road and Ranch, Pond Ranch, Antelope Springs, Alkali Summit, Alkali Lake, Pea Vine Summit, Pea Vine Hotel, Pea Vine Valley, Truckee Summit, Junction Stone's Road, Fuller's Crossing of the Truckee River, 160 miles from Oroville, and 283 miles from Sacramento.

The advantages of this route consist in its low grades and a lower altitude of summit than upon the other routes. But it also presents disadvantages, which render it next to impossible for us to avail ourselves of its advantages in this respect. It is 80 miles further from Sacramento to Fuller's Crossing of Truckee, by this route, than by our present location.

Bald Rock Canon, about 20 miles above Bidwell's Bar, is a rocky gorge in the Feather river, rising with smooth granite sides, almost perpendicular, being 3,000 feet high upon the north side, and 2,500 on the South side, the length of the canon being about 1½ miles.

In order to avail ourselves of the lower grades, it is necessary to run near the river, or at an elevation sufficiently high to be above high water; this renders necessary the crossing of all the ravines and tributaries, many of which run in gorges of great depth near their mouths, and also involves the necessity of curving up into them and running down again, in order to procure a suitable crossing.

From Nelson's Point to Bald Rock Canon, about 50 miles, the river runs in a gorge varying from 2,000 to 2,600 feet in hight, at a pretty steep slope, which near the river where our line runs, in many places is perpendicular and generally rocky. The course of the river between these points is

extremely tortuous and winding, the spurs of the mountains upon either side putting out sharply and running by each other like the fingers of two hands thrust together, this involves the necessity of many tunnels upon this 50 miles. The work of construction would therefore be vastly expensive and slow.

In view of our relations with the United States Government and the Union Pacific Railroad Company, who are to build about 1,700 miles in the interior, and who cannot commence until we reach the State line; in view of the increased cost of the line by this route, and the increased cost to Government of appropriation for 80 miles of additional road to the same point; in view of the additional time necessary to construct the additional length of 80 miles, and the physical impossibility of constructing the division from Bald Rock Canon to Nelson's Point in one year, the time required in Pacific Railroad Bill, this route is reluctantly placed among the list of those denominated unavailable for Pacific Railroad purposes, in the present position of railroad affairs.

A barometrical reconnoisance was also extended from the end of instrumental survey on Truckee river, down the same, to Stout's Crossing of the Truckee, thence up Steamboat Valley, and by the present traveled road across the Washoe mountains via Virginia City, down 6 mile Canon and Flowery District to Carson river, and down the same to Fort Churchill, as follows:

Terminus of Survey, Neil's, supposed State Line, Stout's Crossing, Truckee Meadows, Truckee City, Steamboat Springs, foot of Washoe mountains, Toll Road, top of hill, junction with Henness Road, Virginia City, Gould & Curry Mill, foot of 6 Mile Canon, Carson River, Reed's, Fort Churchill.

Returning: Fort Churchill, Virginia City, Gold Hill, Devil's Gate, Silver City, American Flat, top of Washoe mountains, foot of Washoe mountains, Washoe Lake, Washoe City, Galena, Stout's.

A barometrical reconnoisance was also made from Donner Lake, via the old Truckee emigrant trail, to the Henness Road at Sardine Valley, 16 miles.

A barometrical reconnoisance was also made, and observations taken, from Donner Lake up the Truckee river to Lake Bigler, 13 miles.

A barometrical reconnoisance was also made from the head of Donner Lake, via Castle Peak, to the line of our location at foot of Summit Valley, 8 miles.

A further reconnoisance was made from the terminus of our instrumental survey up the Twin Valley creek, into Twin Valley

and across by Castle Peak, into Lower end of Summit Valley, 15 miles.

Particular description of the Location adopted for First Division of Fifty Miles, via Antelope Route, to near the New England Mills; thence via Preliminary Survey to Eastern Boundary of California.

Commencing at the foot of K street in the city and county of Sacramento, where it intersects the water front of the Sacramento river, the line passes northerly and west of the City Water Works building, through what is known as Slater's Addition, for about fifteen hundred feet, thence crossing to the east it strikes the main North Levee at the intersection of Sixth with E street; thence it follows the line of North Levee for about three miles to a point near the old Muldrow House; thence curving to the left it passes across the space of low land lying between the levee and the American river, about half a mile in width, upon trestle bents averaging about fifteen feet in hight, and crosses the American river with two 192 feet spans of Howe's Truss Bridge; thence running straight over about one thousand feet of low land upon trestle bents, the line curves to the right into a direction of North 24° 30′ East, magnetic, and pursues its course in a straight line to about sixteen miles from Sacramento, across the Rancho del Paso, passing about one mile easterly from the Arcade House, crossing the north line of said ranch about one-half mile westerly from its northeast corner, and striking near the southwest corner of section 21, township 10, north Range 6, East, and crossing a corner of sections 16 and 15 to a point on the aforesaid section 15, distant about sixteen miles from the foot of K street in the City of Sacramento, at which point the line enters the county of Placer. Thence curving gently to the left, and reversing to the right again, it crosses Dry Creek with four 55 feet spans of bridge, and passes about 300 feet westerly of Dudley's house; thence curving gently to the right, it follows for about two miles along the foot of a light ridge in a direction parallel with Dry Creek and Secret Ravine, to the California Central Railroad, at a point known as Grider's, in section 2, Township 1, north Range 6, East. Thence running northerly for about one mile, the line curves to the right and crosses Antelope Creek with a 50 feet span, about 500 feet from its intersection with Secret Ravine, and attaining the top of the divide or ridge between Antelope and Secret Ravine, it follows the same, passing through sections 35, 36, 25 and 24 of Township 11, north Range 6, East, and sections 19, 18, 17, 8, 9 and 4

of Township 11, north Range 7, East, to what is known as the Big Reservoir, at the head of Red Ravine, a point distant about twenty-six miles from Sacramento, at which point commences the maximum grade of 105 feet per mile. Thence pursuing a northeasterly course, it continues along the top of said ridge or divide, crossing the main Antelope road at the flume known as Antelope divide, passing through sections 34, 27 and 26, of Township 12, north Range 7, East. Thence curving sharply to the right and reversing to the left, in about half a mile further it reaches the summit of the divide between Dutch Ravine and Secret Ravine, at a point known as the Caperton Flume, distant about three miles southeast from Gold Hill, in Placer county, and about four miles westerly from the Auburn Station—the terminus of the Sacramento, Placer and Nevada Railroad. Thence running a little north of east the line follows up said divide, crossing the main Auburn and Sacramento road to what is known as Newcastle Gap, in said ridge between Dutch Ravine and Secret Ravine, crossing said gap with an embankment 62 feet high, and passing through sections 26, 23 and 24 of Township 12, north Range 7, East, and section 19, Township 12, north Range 8, East—said point being distant 31 miles from Sacramento. Thence pursuing a general course of nearly due East, the line follows the south side of the hill of Dutch Ravine for about two miles, passing through sections 19, 20 and 21, of Township 12, north Range 8, East. Thence curving to the left the line crosses Dutch Ravine near its head, about $\frac{1}{4}$ mile below the Bloomer Ranch House, and crosses the divide between Dutch Ravine and Baltimore Ravine, passing along and near the Bear River Ditch to the main stage road between Auburn and Sacramento—being at said point distant about $\frac{1}{2}$ mile south of the town of Auburn, on section 15, Township 12, north Range 7, East—distant $34\frac{1}{2}$ miles from Sacramento. Thence curving to the left into a general northerly direction, the line follows near the top of the divide between the American river and Auburn Ravine, and near the Bear River Ditch, $\frac{1}{4}$ mile west from the Junction House, and through sections 15, 10, 3 and 2, of Township 12, north Range 7, East, and sections 34 and 35 of Township 13, north Range 7, East, to the head of Rock Creek, at which point the line reaches the summit of the divide between Dry Creek and the American river—distant about 39 miles from Sacramento. Thence pursuing a north-easterly course along the top of said ridge or divide, passing about $\frac{1}{8}$ mile south of Lovell's house and near the Cataract Mill, crossing through sections 35 and 25, of Township 13, north Range 8, East, and sections 19, 17 and 8, of Town-

ship 13, north Range 9, East, the line reaches the Clipper Gap, in section 19, at a point distant about 44 miles from Sacramento. Here, instead of following the top of the ridge further, it rising too rapidly for our grades, we curve to the right and run up the north side hill of Clipper Ravine (a tributary of the North Fork of the American), crossing several short, steep-side ravines to Wild Cat Summit. Passing through Wild Cat Summit (about ¼ mile south of Widow Hawes' house), we pass around Hawes' Hill, and curving to the left, cross the main road and pass up a smooth ravine to the top of the ridge at a point called Applegate Summit. A short distance further on, the line passes through Evergreen Gap, crossing the divide again at Baney's Gap, from which point it curves around in the side hill (on North Fork side) to Star House Gap, near the Star House. Here the line crosses the Star House Gap (and the traveled road) about 50 feet high, passing up very nearly on top of the divide to the head of Applegate Ravine, which runs into Bear river, this point being called New England Gap—distant about 50 miles from Sacramento. From New England Gap the line passes out upon the north side hill of North Fork; crossing the traveled or stage road, it runs along above the same, and about 500 feet above New England Mills; thence through the peach orchard of Murphy to Station 2,640, which point is about one mile north of the New England Mills, and the terminus of the 1st Division of 50 miles.

For a further description of the general line of road from this point to the Eastern boundary of the State, reference is had to a previous report of the Chief Engineer upon the preliminary survey, cost of construction, and estimated revenue of the Central Pacific Railroad of California, published October 1st, 1861, and subsequently re-published October 22d, 1862.

DESCRIPTION OF OTHER SURVEYS.

Clipper Gap, upon the top of ridge between the American river and Dry Creek, about 44 miles from Sacramento, being a point common to all the proposed lines from Sacramento, upon the Dutch Flat route, several lines have been surveyed and located for the purpose of determining the best, which are denominated as follows:

1st. Route via Auburn Station.
2d. Secret Ravine Route.
3d. Antelope Ravine Route.
4th. Doty's Ravine Route.
5th. Dry Creek Route.

The 1st, 2d, 3d, and 4th, of the above enumerated lines, have a common point at or near Auburn, the 5th at Clipper Gap.

1st.—ROUTE VIA AUBURN STATION.

This line pursues the direction already indicated from Sacramento to Dry Creek, about 16 miles; thence curving southerly it follows up the divide between Miner's Ravine and Strap Ravine; thence via Miner's Ravine it strikes the Sacramento, Placer and Nevada Railroad at Wildwood, and continues upon south side of same to Auburn Station; from this point to Bloomer Divide near Auburn, two lines have been run and located, one upon an 80 feet grade to Newcastle Gap, and thence a 90 feet grade to Bloomer Divide, the other upon a 105 feet grade from Auburn Station to Bloomer Divide. Preliminary and location lines have been run upon both routes.

A line was also run and located from Dry Creek, via Grider's and Miner's Ravine, to Wildwood, but abandoned.

2d.—SECRET RAVINE ROUTE.

A line has been run upon this route, from Grider's to Auburn, but it was found impossible to attain the required elevation without using a higher grade than the maximum allowed by the Pacific Railroad Bill.

3d.—ANTELOPE RAVINE ROUTE.

This route has been fully described in the *particular* description of line, it saves 3¼ miles in distance over the Auburn Station line, and about 8½ miles over the Dry Creek line.

4th.—DOTY'S RAVINE LINE.

A line was run from McBowen's Ranch, on Dry Creek line, near Gold Hill, via Doty's Ravine, Doty's Flat, Ophir and Millertown, to Auburn, but it was found that it would be necessary to attain a higher elevation than the town of Auburn, which would require a grade higher than our maximum, and this line was therefore abandoned.

5th.—DRY CREEK LINE.

This line follows the present line of road to Grider's; thence runs near the present line of California Central Railroad to Lincoln; thence via Gold Hill and Virginia; thence via McBowen's Ranch, Sailors' Ravine, Moore's Bar, Sedgerst Summit, Taylor's Ravine, it reaches the south side hill of Dry Creek; thence following the same, it encounters and runs up Deadman's Ravine; thence crossing and running down the same, it continues up the

same via Page's, Redum's, Hawes' Store, Cook's, Watson's, Neilsburgh, Gassoway's and Predmoer's, to Clipper Gap.

Three lines of location, contingent upon this line, were run from Sacramento across to the line of the California Central Railroad.

"A"—Line striking at Leets.

"Ex"—Line striking at Pleasant Grove.

"B"—Line striking at Lincoln.

This line being 9 miles longer, and requiring the maximum grades with increased curvature, was finally abandoned. Experimental and location lines were run upon the Dry Creek lines.

MILES OF LINE RUN AND ESTIMATED BY THE ENGINEERING DEPARTMENT, FROM OCTOBER 1ST, 1860, TO OCTOBER 1ST, 1861.

Barometrical Reconnoisance.	*Miles.*
Barometrical Reconnoisance via Georgetown to Summit...	97
" " " Duch Flat to Fort Churchill	190
" " " Nevada and Henness Pass..	143
" " " Miscellaneous.....	50
Total Barometrical Reconnoisance.....	480

Preliminary Lines.	*Miles.*
Preliminary Line from Lincoln to Truckee River..... ..	102
" " " Gold Hill to Auburn.....	11
" " " Miscellaneous.....	5
Total Preliminary Lines.....	118

MILES OF LINE RUN AND ESTIMATED FROM OCTOBER 1ST, 1862, TO JULY 1ST, 1863.

Barometrical Reconnoisance.	*Miles.*
Via Yuba Gap.....	145
" Middle Feather River.....	160
Total Barometrical Reconnoisance.....	305

PRELIMINARY AND LOCATION LINES RUN.

		Preliminary.	*Location.*
1st.	Sacramento to Grider's.....	18	18
2d.	" " Leet's.....	18	18
3d.	" " Pleasant Grove.....	21	21
4th.	" " Lincoln.....	25	25

	Preliminary.	*Location.*
5th. Leet's to Grider's	3	3
6th. Lincoln to Clipper Gap	27	27
7th. Grider's to Bloomer Ranch	16	
8th. " " " "	16	16
9th. Grider's to Mildwood via Miner's Bar	7	7
10th. Grider's to Bloomer Divide	22	22
11th. Auburn Station to Bloomer Divide	21	21
12th. Auburn Station to Kelley's	2	2
13th. Sundry Preliminary—Auburn to Auburn Station	20	
14th. Wildwood to Auburn Station	6	6
15th. Auburn to Illinoistown	20	20
16th. Sundry Preliminary Lines	5	
17th. In Sacramento	6	3
Total	253	209

SUMMARY.

Or a Total of Barometrical Line	785	miles.
" " " Preliminary "	371	"
" " " Location	209	"
In all	1365	"

GRADES.

The following table shows the number of miles of each grade, upon the several routes, on the 1st Division of 50 miles.

TABLE OF GRADES

ON LOCATED LINES OF CENTRAL PACIFIC RAILROAD OF CALIFORNIA, FROM SACRAMENTO TO STATION 2,640.

Grade per Mile.	Antelope Line. MILES.	Auburn Line 80′ Gr. MILES.	Auburn Line 105′ Gr. MILES.	Dry Creek Line MILES.
0.5	.....	.....	.....	0.95
2.5	3.58	3.58	3.58	3.65
5	0.38	0.38	0.38	0.57
10	1.05	1.13	1.13	1.47
16	2.60	1.51	2.51	2.80
21	3.87	2.43	1.45	3.15
26	4.75	6.56	6.56	5.75
31	.....	1.05	1.05	0.75
35	.....	.....	.....	0.90
37	0.58	0.09	0.09	1.25
40	0.38	0.38	0.38	0.57
42	0.38	1.33	1.33	2.35
45	0.38	.....	.....	0.75
47	0.38	0.38	0.38	0.41
52	4.05	4.75	4.35	3.55
58	0.58	0.19	0.19	0.19
60	.....	.....	.....	0.35
63	1.04	3.50	3.30	0.19
68	0.20	0.19	0.38	0.66
74	0.20	0.85	0.85	0.25
78	0.98	.....	.....	.....
80	0.68	2.70	1.15	0.48
84	.....	2.84	.....	.....
88	0.17	0.17	0.17	0.17
90	2.60	5.07	2.58	8.18
105	11.89	6.11	10.45	7.85
∠	9.28	9.76	9.81	10.86
Total..	50.00	53.35	52.07	59.05

From the above table of grades it will be seen that while the adopted line has more miles of maximum grade, yet, taking the grades from 80 to 105 inclusive and it stands 15.35, 16.89, 14.35 and 16.68, while the distance to the same point by the different lines are 50 miles, 53.35, 52.07 and 59.05.

ALIGNMENT.

The following table shows the number of feet in length of the different curves and tangents, also the total number of miles of curved and straight line. Also the total amount of curvature in degrees, and also in circles of 360 degrees each, upon the first division of fifty miles of the Central Pacific Railroad:

TABLE OF CURVES

ON LOCATED LINES OF CENTRAL PACIFIC RAILROAD OF CALIFORNA, FROM SACRAMENTO TO STATION 2,640.

Radius of Curvature.	ANTELOPE LINE.		AUBURN LINE. 80′ Grade.		AUBURN LINE. 105′ Grade.		DRY CREEK LINE.	
Feet.	Distance. Feet.	Curvature. Degrees.	Distance. Feet.	Curvature. Degrees.	Distance. Feet.	Curvature. Degrees.	Distance. Feet.	Curvature. Degrees.
5,730	3,053	31	5,224	55	5,524	55	1,759	18
3,820	2,320	35	600	9	600	9	1,160	17
2,865	8,221	164	10,900	202	11,085	221	5,836	117
2,292	4,250	106						
1,910	3,016	90	8,367	251	8,397	252	6,866	206
1,637	2,102	74	2,102	74	2,102	74	2,102	74
1,432	12,398	496	12,097	484	14,655	586	19,547	782
1,146	4,032	202	7,172	359	4,002	200	10,842	542
1,075	83	4			83	4		
955	22,734	1,364	25,716	1,543	23,502	1,410	26,341	1,580
819	1,740	122	980	69	700	49	6,190	433
800	910	67	910	67	910	67	910	67
764	730	55	730	55	730	55	730	55
716	23,524	1,882	16,680	1,334	17,049	1,364	18,505	1,480
638	600	55	2,475	241	600	55	3,175	286
573	3,800	380	6,651	665	5,200	520	8,680	868
Straight Line.	170,486		181,583		179,800		199,140	
Total number of feet and degree of curv're	264,000	5,127	281,687	5,008	274,929	4,921	311,783	6,525

	ANTELOPE LINE. Number of Miles.	AUBURN LINE. 80′ Grade. Number of Miles.	AUBURN LINE. 105′ Grade. Number of Miles.	DRY CREEK LINE. Number of Miles.
Curved Line.	17.71	18.96	18.02	21.34
Straight Line.	32.29	34.39	34.05	37.71
Total number of Miles	50.00	53.35	52.07	59.05
Number of Circles.	14.2	15.0	13.7	18.1

ESTIMATES.

APPROXIMATE ESTIMATE OF THE TOTAL COST OF 1ST DIVISION OF 50 MILES OF CENTRAL PACIFIC RAILROAD OF CALIFORNIA.

Total cost of grading, masonry, bridging, ties, and track laying of Sections 1 to 18 inclusive, as per existing contracts	$400,000
Total cost of grading, masonry, bridging, ties, and track laying of Sections 19 to 50 inclusive, as per proposals received from contractors	1,835,896
Total cost of iron rails, locomotive engines, passenger, baggage and freight cars, turntables, switches and frogs, and machinery for machine shop	721,000
Total cost of buildings, machinery, right of way and engineering	175,000
Contingencies	89,600
Total cost of 1st. Division of 50 miles	$3,221,496

For detailed estimates of the above, as also the actual cost of grading, masonry, etc., already performed, you are respectfully referred to accompanying schedules, marked D, E and F.

SECOND DIVISION OF FIFTY MILES

Reaches to within 6 miles of the summit of the Sierra Nevadas.

A party, under the charge of S. S. Montague, Esq., are in the field making permanent location of the 2nd division. Ten miles, or to Long Ravine, are already located, and the balance will be completed during this fall, so that the 2nd division can be placed under contract by the 1st of December, 1863.

PROGRESS OF WORK OF CONSTRUCTION.

The work of construction was commenced by placing the grading, masonry, bridging, ties, and track laying of that portion of the work between the foot of K street, Sacramento, and the line of the California Central Railroad at Grider's (comprising sections 1 to 18 inclusive), under contract to C. Crocker & Co., December 27th, 1863.

This work was afterwards let by C. Crocker & Co., as follows:

From 6th Levee to end of Levee work (about 3 miles), to S. D. Smith.

From thence, the piling, trestling and bridging across the American river, to Baker & Hubbard.

From thence, sections 5 to 10 inclusive (about 6 miles), to S. D. Smith & Co.

From thence, sections 11 to 18 inclusive (about 8 miles), to Messrs. White & Gay.

Sections 7, 8, 9 and 10 were subsequently let by S. D. Smith & Co. to Charles Bates.

Sections 11 and 12 were let by White & Gay to John Coffee.

Part of section 15, section 16, and part of section 17, were let by White & Gay to Boyle & Mahon.

Part of section 17 and section 18 were let by White & Gay to Collins.

At present date, the levee is completed from the intersection of E and 6th streets to the point of leaving the levee near Tivoli, and ready for laying track.

The lumber for the American River Bridge has been delivered, the bridge framed, and the foundation of north pier completed, ready for raising the pier.

The coffer dam around center pier is driven, and only the capping of piles remains to complete the foundation.

The foundation of south pier is completed, and the timber pier is in process of construction.

The lumber for piers has partly arrived, and the balance is on its way.

Nearly all the lumber for the trestling has arrived, and about two-thirds of the same is framed.

Sections 5 to 10 inclusive, are completed, and ready for laying track.

Sections 11 to 16 inclusive, will be completed by the latter part of August.

Sections 17 and 18 having been delayed until the line of per-

manent road eastwardly was adopted, they will not be completed as soon as the others, but will be finished so as to cause no delay to the track laying.

CHARACTER OF MATERIAL.

The cost of grading the first 18 miles has been somewhat enhanced, in consequence of encountering a larger proportion of hard material than was at first anticipated; over one-third of the whole quantity of material excavated up to the present time being cement, costing more than double the price paid for excavating earth.

Also, from the fact that this hard material underlies the earth, on most of the line from the American river eastwardly, at from 1 to 2 feet only, below the surface, rendering it difficult to find borrowing material for embankments without excavating over a considerable area of surface.

Also, from the fact that the experience of this season in high water at the bridge across the American river, has demonstrated that it is necessary, in order to render the piers secure beyond a contingency, that they should be filled around pretty extensively with cobble stone which is now being done.

CULVERTS

Were originally intended to be built of stone, but in consequence of the distance which the stone had to be hauled, and therefore their increased cost, culverts of brick were substituted.

The total number of culverts on sections 1 to 18 inclusive, is 36, of which 26 are completed, there are three in process of construction, and 7 remaining to be completed.

These culverts are barrel and arch culverts—the largest being 8 feet span.

They are built of hard burned brick, in a substantial and workmanlike manner, the parapet walls will be coped with cut granite, of 8 inches in thickness, securely fastened to the walls with iron anchors.

TRESTLING.

There are two heavy pieces of trestling on the first division, requiring 283,000 feet, board measure, of timber, and about 800 redwood piles from 12 to 30 feet in length. This trestling has been planned with a view to strength, safety and durability; the ties, stringers, corbels and caps being of best quality of Puget Sound pine, and the posts, braces, sills and piles of coast or black redwood, from Santa Cruz.

THE PLAN OF TRESTLING

Is simple in its details, consisting of two perpendicular main posts twelve inches square let into a 12 by 12 inch sill, with mortise and tenon directly under the bearing of the track stringers. Two brace posts, 10 by 12 inches, extend down on either side of the main posts (with a run of one foot in three) into the sill, to which they are also secured, and are bolted at the top to the main posts with inch iron bolts and heavy cast iron washers, the sills resting on four piles of redwood timber, which are let into the sill with mortise and tenon. The piles are driven so as to come directly under each post and also under the lower end of the main post braces. The posts are capped with a timber 12 inches square and 9 feet long, into which the posts are tenoned and pinned. Upon the caps rest the corbels, 12 inches square and 9 feet long. Upon these corbels are laid the stringers, 12 by 15 inches and 15 feet long, which are secured by two-inch iron bolts at each end, passing down through either ends of stringers and corbels. The caps are notched one inch to receive the corbels.

Upon the stringers rest the cross-ties, 3 by 8 inches and 8 feet long, securely spiked down to the stringers. Upon these cross-ties the rail is laid and secured in the usual manner. The bents are placed at intervals of 15 feet from center to center.

THE TRESTLING AT SOUTH SIDE OF AMERICAN RIVER BRIDGE

Is 2,200 feet in length, commencing at the levee a short distance above the Tivoli House, and consists of 151 bents, from 8 to 17 feet in hight. Short bents at the end of trestling join it to the levee embankment, making a thorough connection with the same. Most of these bents are framed and upwards of 100 piles already driven.

THE TRESTLING AT NORTH END OF AMERICAN RIVER BRIDGE

Is 615 feet long, and composed of 42 bents from 9 to 18 feet in hight. It is similar in character to that on the south side of the river. The foundations of trestling are all of piles.

AMERICAN RIVER BRIDGE

Is planned upon the principle of the Howe Bridge, crossing the American river in two spans of 192 feet each in the clear, with an elevation above the highest water of 6 feet in the clear.

The piers, for present purposes, will be built of timber, and so constructed as to allow stone piers to be built within them. The details and dimensions of its parts have been planned to correspond with its importance, and no considerations of economy have been allowed to interfere with a perfect and thorough combination of strength and durability. It contains 183,000 feet, board measure, of timber; 44 tons of iron bolts and washers, and weighs about 400 tons, which, with 375 tons (the greatest load to which it can ever be subjected), gives 775 tons as the whole weight of structure and load, one-half of which, or 388 tons, is supported by each span. The total length is 397 feet; hight of truss, 24 feet; width of truss from out to out, 18 feet 8 inches; width of truss in clear, 13 feet. It has two bottom chords, consisting of six pieces each, two of which are 5½ by 16 inches, and four are 4½ by 16 inches, with an intermediate space of 1 inch, admitting the main tension bolts, giving an aggregate cross section of lower chord of 896 square inches. There are also corbels at either end of each span, with a cross-section of 792 square inches, the corbels extending 22 feet from either end of chords and resting on four wall plates, 10 by 12 inches. The upper chords also consist of six pieces of the same width as the lower chords, 12 inches deep, with a center rib of 6 inches in depth extending over six panels and firmly bolted to the upper chord, giving an aggregate cross-section of 1,008 square inches. All the chords are framed. The dimensions of the main braces at the ends of each span are 10 by 12 inches, diminishing in size towards the center. The counter braces at the ends of the bridge are 8 by 12, which also diminish towards the center. The largest main tension bolt is 2 inches in diameter, diminishing to 1½ inches at the center. The angle blocks, of cast iron, are all cast to a length corresponding to the total width of chords, with a face equal to the size of the ends of the braces, which are secured in their places by flanges. There are also three iron tubes or boxes, of the same length as the depth of the chords, through which the tension rods pass.

All the iron for this bridge is now delivered.

THE FOUNDATIONS OF PIERS AND ABUTMENTS OF AMERICAN RIVER BRIDGE

Are of redwood piling, driven at intervals of 2 feet from center to center. It was necessary, in the middle pier, to use iron shoes, to drive the piles to the required depth, the hard bottom being composed of boulders. The piles are tenoned and capped with timbers 12 inches square, upon which are laid longitudinal timbers of the same dimensions as the caps, one foot apart, and

secured by drift bolts. On these timbers a solid flooring of 10 by 12 inch timbers is laid, projecting one foot beyond the footing course of the intended masonry. There are 370 piles in the foundations, of about 30 feet in length.

THE MASONRY IN PIERS AND ABUTMENTS OF AMERICAN RIVER BRIDGE

Will be of the best description of hammer-dressed masonry, with rock face, laid in regular courses, with stone of uniform thickness, of the best quality. The stone will conform to a plan so arranged as to break joints as well in the center as the face of the wall. The stone will be dressed to their proper dimensions before being brought on the wall, and no work will be allowed on the wall to the injury of the stone already laid. The coping will be laid with broad stone, dressed down to an even surface, to receive the wall plates. The cement will be of the best hydraulic cement, in the proportion of one of cement to two of clear, sharp sand.

BRIDGE AT DRY CREEK

Is planned upon the principle of the Burr bridge, which experience has proved to be well adapted for short spans.

This bridge is built in 4 spans, of 54½ feet each, from center to center of pier, making a total length of 218 feet. It is connected with the embankment at each end by shore bents, the stringers extending to the bank in the same manner as described in the trestle work at Arcade Creek.

This will be a *deck* bridge, the cars running upon the top of the same.

Each of the *chords* of each span are composed of two lengths of timber reaching from center to center of pier, 54½ feet long, 8 inches thick, and 12 inches high, placed five inches apart, between which are placed the posts 10 feet long, 12 by 12 inches, notched so as to pass between the *chords*, at intervals of 6½ feet. Main braces, 6 by 12 inches, extend from bottom to top of posts.

Upon the upper chords rest floor beams, 10½ feet in length, 6 by 12 inches, at intervals of about 2 feet from center to center.

Upon the floor beams are placed track stringers, 10 by 12 inches.

Upon the track stringers rest sawed cross ties, 8 feet long, 3 by 8 inches, at intervals of two feet from center to center.

The iron rail is firmly spiked on to these cross ties.

The chords are securely bolted together by 288 five-eighth bolts in each span, with 576 cast washers.

The lower chords rest upon corbels or bolsters, over each pier, 13 feet long, 20 inches wide, and 12 inches high, securely bolted on to the chords with $\frac{3}{4}$ inch bolts.

Length of span from center to center	.....	54½	feet.
Cross section of upper chords at	Center	384	square inches.
" " " " " "	Ends	384	" "
" " " lower chords "	Center	384	" "
" " " " " "	Ends	384	" "
" " " corbels	.....	240	" "
Hight of truss from top of upper to bottom of lower chord	.....	11	feet
Hight of truss inside of chords	.....	9	"
Width of truss from out to out of chords	.....	10	" 6 inches.
Width of truss inside of chords	.....	6	" 6 "

There will be 306 cubic yards of rubble bridge masonry in the 5 piers, laid in cement.

STONE PIERS

Will be of rubble masonry, the stone to be of good quality. The corner stones and coping will be dimension stone, with dressed beds and joints, and rock face, an arras of one inch to be cut on the angles or corners, true to the batter marked on the plan.

The body of the work will be laid of stone of large size and regular courses, the whole thoroughly bonded with the proper proportion of headers and stretchers, and will in all cases be so scabble pointed, or otherwise dressed, with joints not exceeding an inch in width, as to have a good general bearing upon each other without the aid of chips, pinners or anything that may be removed or cracked; and no chips or pinners will be put into the face of the work. The tops of the walls to be dressed with coping stone of even thickness, so leveled and dressed as to give a uniform and substantial bearing to the wall plates.

FOUNDATIONS.

The pits for foundations will be excavated to hard bottom, leveled off and the footing course laid, thereby doing away with timber in the foundations; the line of hard bottom is from six to twelve feet below the surface of the ground.

ARCADE CREEK TRESTLING

Is 220 feet in length, and consists of 14 bents, placed at intervals of 15 feet. The bents are placed at an angle of 45 de-

grees with the line of road, that being the general course of the creek at the point which we cross.

PLAN OF TRESTLING AT ARCADE CREEK

Is similar to that of the American river, excepting the foundations, which are of plank 3 inches in thickness, and 5 feet in length, laid at right angels to the bents. The foundations are excavated down to solid material, upon which plank are laid as above described. The end bents are connected with the bank by stringers, extending 13 feet beyond the end of same, resting on the bank sills firmly embedded in the embankment.

The timber is framed and will be ready for raising in a few days, making a completed road-bed from the American river to section 12.

In this structure there is 20,000 feet, board measure, of timber, and 800 lbs. of iron.

CROSS TIES

Are of redwood, the joint ties being 6 by 10 inches, and 8 feet long; the intermediate ties being 6 by 8 inches, and 8 feet long; 68,000 ties are under contract, 4,000 are delivered at Sacramento, and the balance to be delivered so that the work of track laying may progress uninterruptedly.

IRON.

Six thousand tons, or over 60 miles, have been purchased, contracted to be delivered at the rate of 500 tons per month. A considerable portion of this iron has been shipped, and is on its way to California.

The spikes and chairs necessary to complete 60 miles, have been purchased, and are being sent forward.

LOCOMOTIVES.

The following locomotives have been purchased in the Atlantic States, for the 1st Division of 50 miles:

Of William Mason & Co., Taunton, Massachusetts.

1 locomotive, 15 by 22 inch cylinders.
1 locomotive, 16 by 24 inch cylinders.
1 locomotive, 17 by 25 inch cylinders.

Of Norris & Co., Philadelphia.

1 locomotive, 15 by 22 inch cylinders.

Of Danforth, Cook & Co., Patterson, New Jersey.

2 tank locomotives. In all 6 locomotives.

PASSENGER CARS.

Six first class passenger cars have been purchased of Mason & Co., of Springfield; also, 2 baggage cars; also, 25 platform freight cars; also, 15 box freight cars; also, frogs, switches, turn-tables, etc., necessary for the first 50 miles.

Proposals have been invited and received for the grading and masonry, etc., of the remaining portion of the 1st Division.

Twenty-three bids were received, a number of which, from responsible parties, will range within my approximate estimate of the cost of grading, masonry, bridging, etc., for this portion of the work.

Sections 19 to 31 inclusive, or from the line of the California Central Railroad to Newcastle Gap, have been let to responsible contractors, and will be commenced immediately.

I would advise, that for present purposes, we follow the line of 6th and I street to Front, leaving the heavy work between 6th and E streets and the Water Works Building, to be performed next Summer.

I would also remind the Board, that in order to preserve the charter granted us by the Territory of Nevada, it will be necessary to make a survey of the line in Nevada this year. I respectfully ask action upon it.

I also invite your attention to a previous report, giving the dates at which it will be necessary to place the 2d and 3d Divisions under contract, in order to complete the same within the time required by Act of Congress.

Accompanying this Report will be found in document "A," a printed form of general contract for grading, masonry, bridging, etc., containing the stipulations required by San Francisco, Sacramento and Placer counties; also, by the By-Laws of this Company in regard to liabilities of the counties and stockholders; also, printed document "B"—general specifications of the manner of executing the work of grading, etc.; also, printed document "C"—a form of release for right of way, etc.

I would also invite your attention to 48 specimens of rock from different localities, upon sections 22 to 50, showing the character of the material in cuts upon the work to be put under contract upon 1st Division; also, *seven specimens of gold, silver and copper ore*, from the vicinity of the line; also to two specimens of iron ore, one of asbestos, and one of soap-stone from the vicinity of the line.

Respectfully submitted,

THEODORE D. JUDAH,

Chief Engineer Central Pacific Railroad.